THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1916.] LONDON, JANUARY 30, 1900. [52ND YEAR. PRICE 6d.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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WELDON MUD
FOR
GAS PURIFICATION.
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

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Parker's Imperial Black Varnish,
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The "DEMAND," REGISTERED *

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FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.

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THESE TAPS ARE
FULL-WAY
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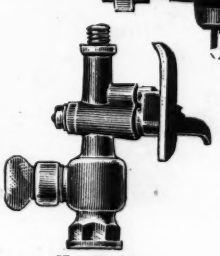
No. A.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.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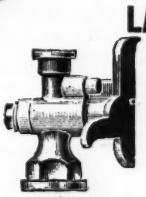
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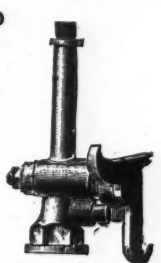
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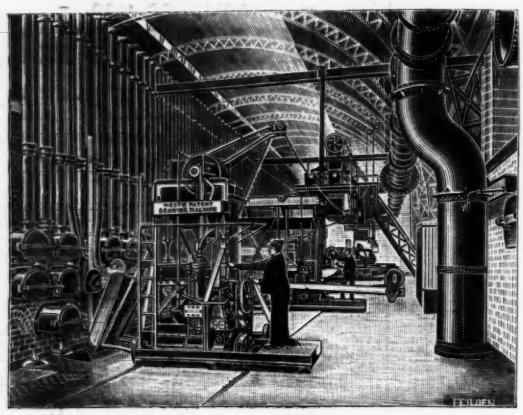
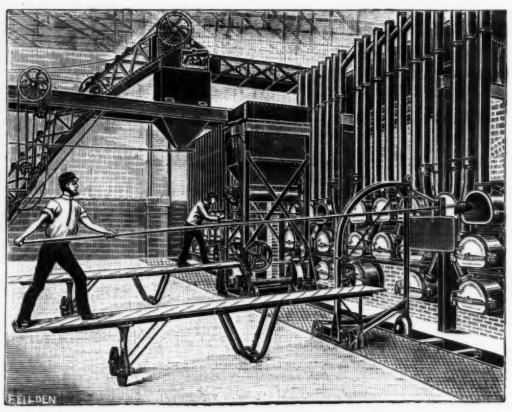
MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



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Silent Coke-Conveyor.

SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

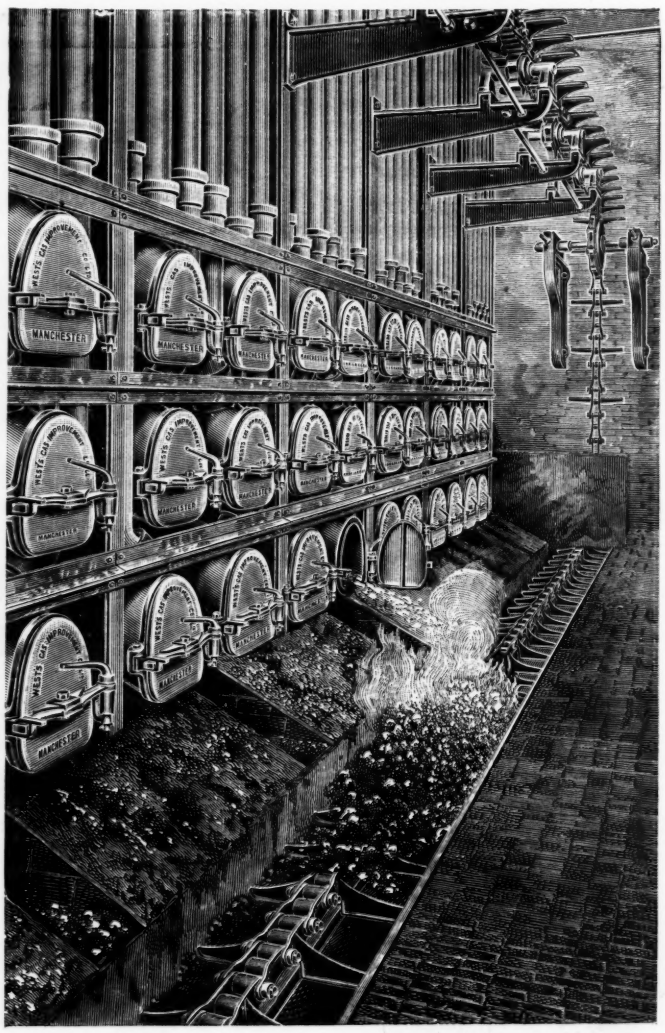
Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.



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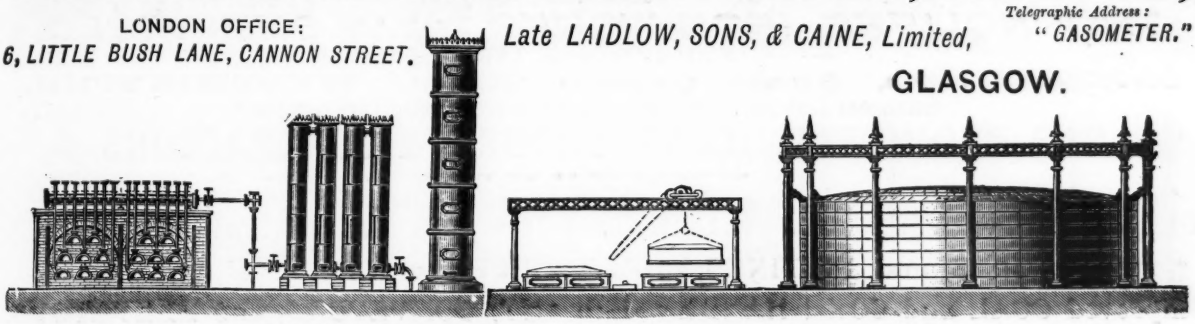

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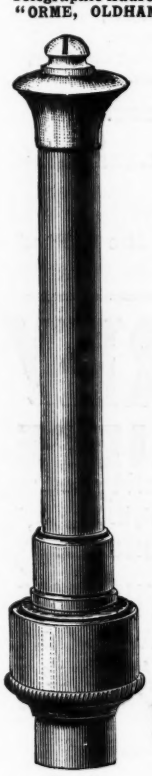

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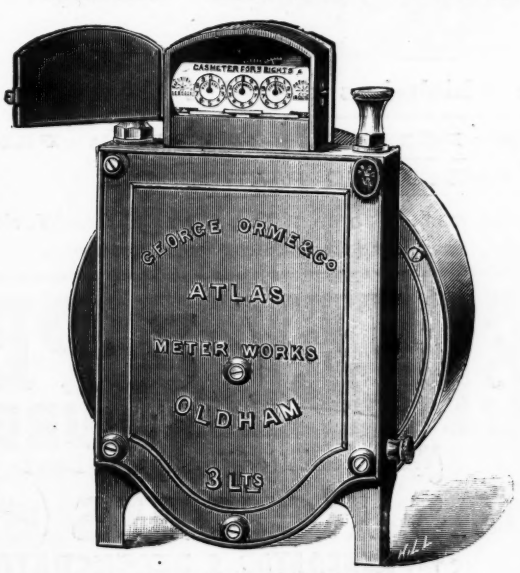

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Main Gas Cocks, Pressure-Gauges, & all descriptions of Gas, Water, & Steam Fittings in stock.

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RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

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DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

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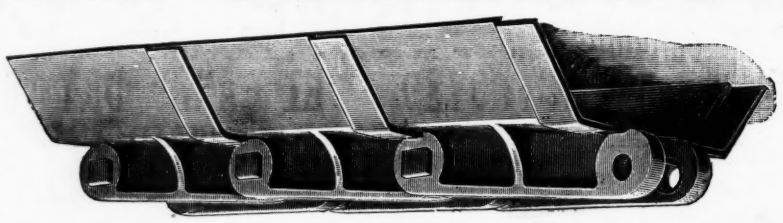

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The fullest Inquiry invited. Can be seen at work in some of the principal Gas-Works in the United Kingdom, where they are giving the utmost satisfaction.

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Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES; BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

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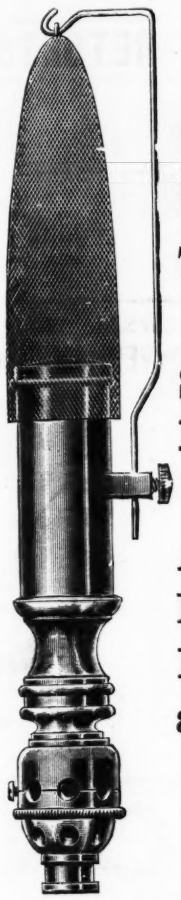

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300 CANDLES PER BURNER

Three Burners consuming 30 cubic feet per hour give a Light of 1000-Candle Power at half the cost of Electric Light.

Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

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Specially Low Terms to Gas Companies for Trial Installations.

"The perfection of artificial lighting on the large scale."—"*Journal of Gas Lighting*," April 18, 1899.

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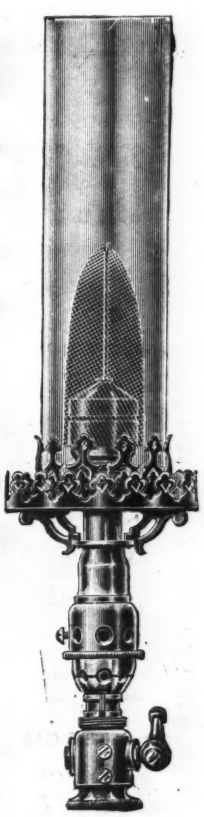

The Intensified Company's Improved Incandescent Burner gives **25 CANDLES PER FOOT**, or 60 Candles for $2\frac{1}{2}$ feet. No other Burner on the Market can compare with this. Price, with Mantle and Chimney, from 6s. 6d. Send for Complete Lists.

The most Effective and Economical Burner on the Market for both Indoor and Outdoor Lighting. Mantles specially manufactured for the Company, for both Systems, by the Welsbach Incandescent Gas-Light Company.

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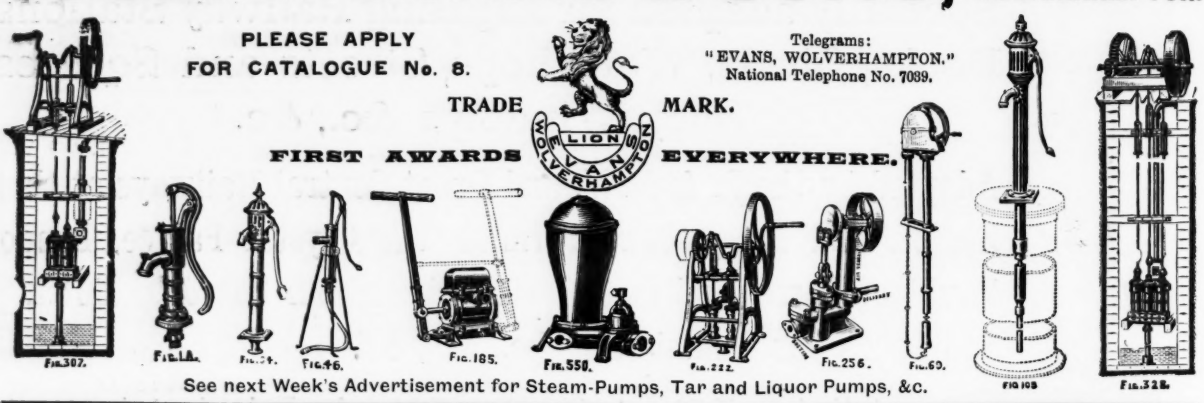

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ALL SIZES.

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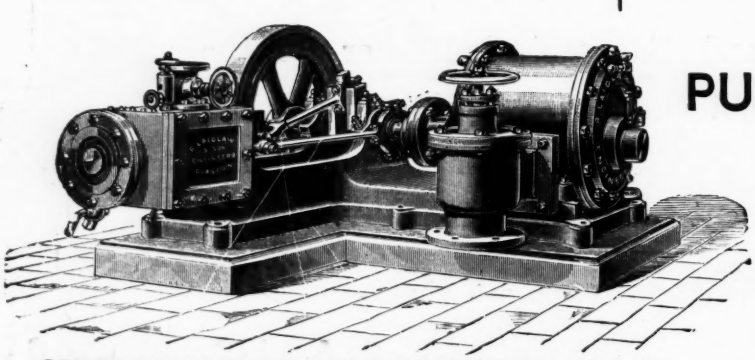

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ALL KINDS OF

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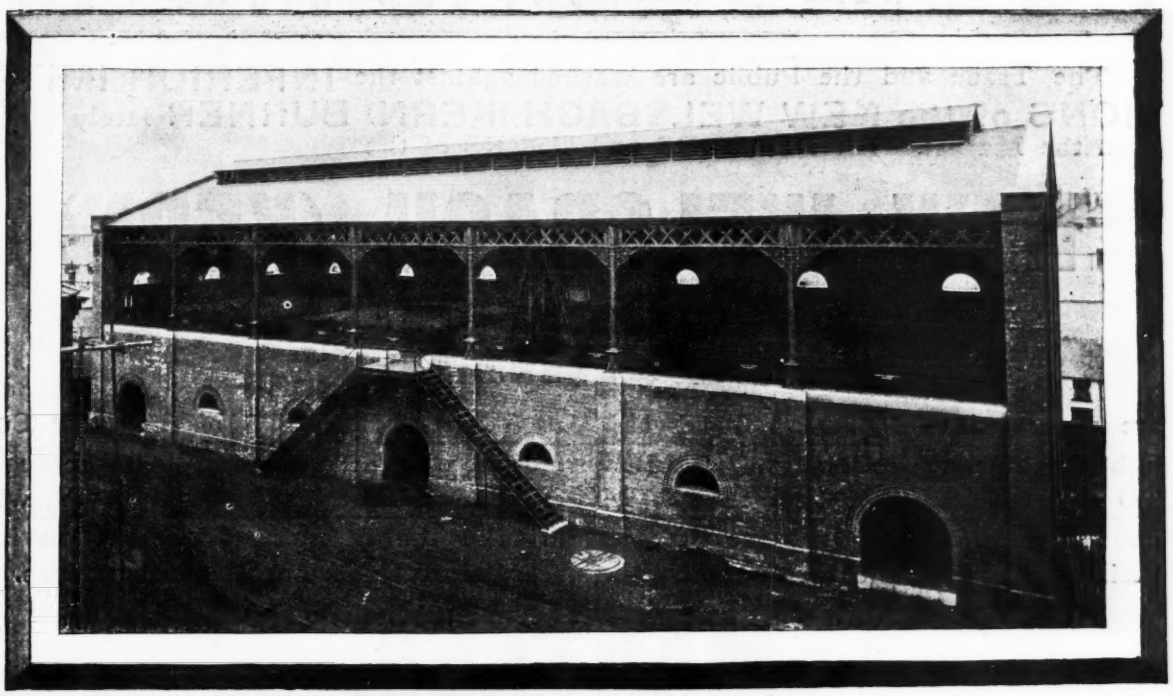

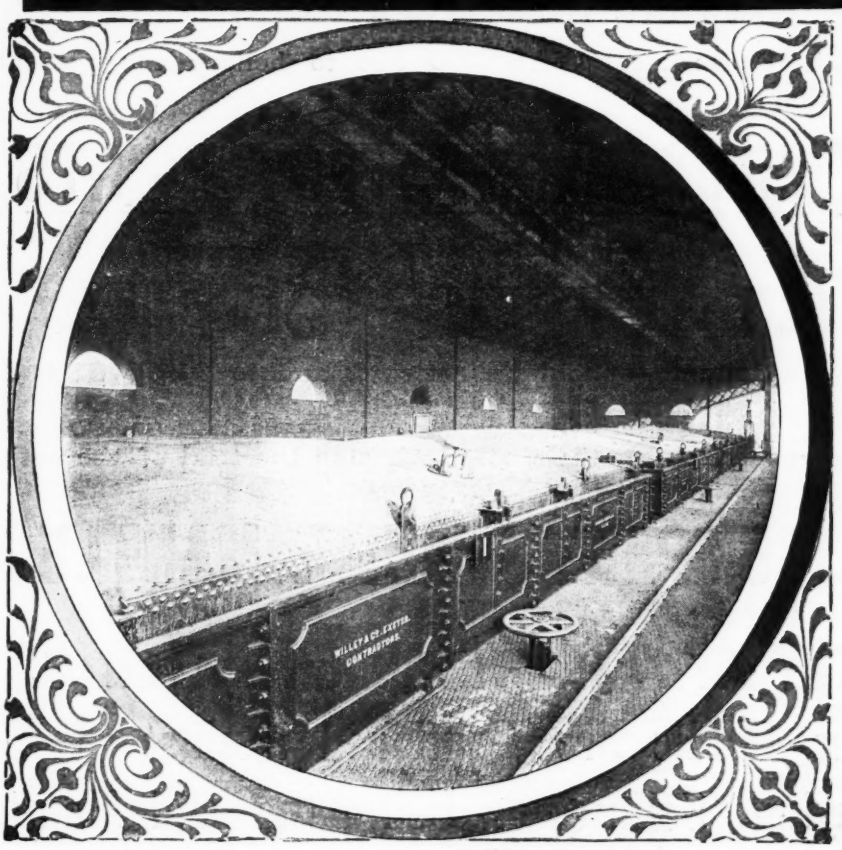

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Purifiers

WITH STAGING, ROOF, 24-IN. VALVES & CONNECTIONS, &c., COMPLETE.

Recently CONSTRUCTED and ERECTED for the

Swansea Gas Co.

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The Trade and the Public are warned against the **INFERIOR IMITATIONS of the NEW WELSBACH (KERN) BURNER** lately placed upon the Market. All DEALERS and USERS of the

NEW WELSBACH (KERN) BURNER

are requested to IGNORE THE NEWSPAPER THREATS of the New Sunlight Incandescent Company, Limited, and, in case of an action being brought, TO AT ONCE COMMUNICATE WITH THE WELSBACH COMPANY, who, upon receipt of the writ, are prepared to take the defence of the action into their own hands, and to indemnify the person attacked from all consequences.

MANTLES.

DEALERS and USERS are also WARNED not to believe the rumours circulated by Infringers that the

WELSBACH COMPANY'S PATENT RIGHTS

expire shortly. These rights

EXIST UNTIL 1907

and the Company will continue to uphold their rights, and to **suppress all Infringers of Mantles as well as of Burners.**

The Welsbach Company are doing their best to hasten the trial of the action now pending in respect of the

SUNLIGHT COMPANY'S WHITE MANTLE

which, it is claimed, is an

INFRINGEMENT OF THE WELSBACH PATENTS.

Dealers and the Public are Cautioned against Buying, Selling, or Using the said Mantle.

THE

WELSBACH INCANDESCENT GAS-LIGHT CO., LIMITED,

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"SPECIAL" GAS-BURNERS.

SUITABLE FOR ALL PRESSURES AND CONDITIONS.

GEO. BRAY & CO.

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THE LEEDS FIRE-CLAY CO., LD., ENGINEERING DEPARTMENT

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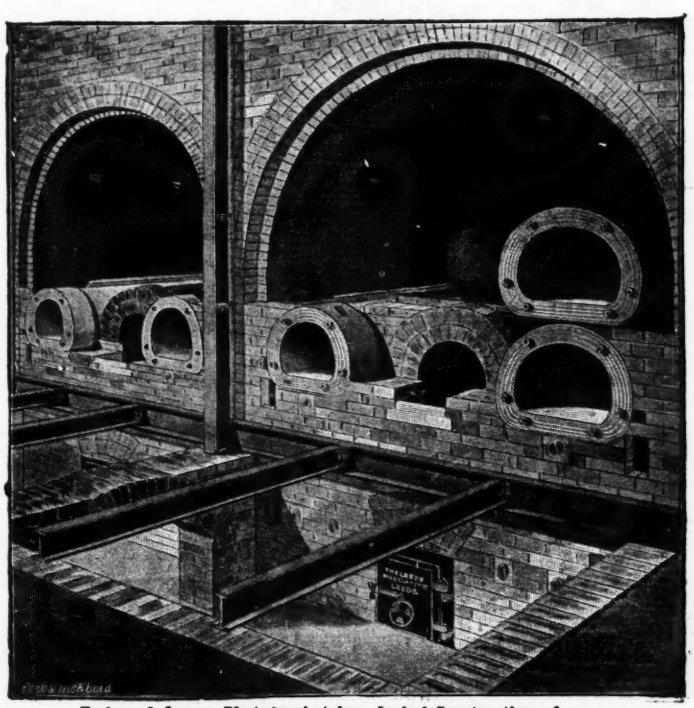

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RETORT-SETTINGS

OF EVERY DESCRIPTION
INCLINED, HORIZONTAL,
REGENERATOR, GENERATOR,
and DIRECT FIRED.

SHALLOW REGENERATORS A SPECIALITY

MANY INSTALLATIONS.
EXCELLENT RESULTS OBTAINED.

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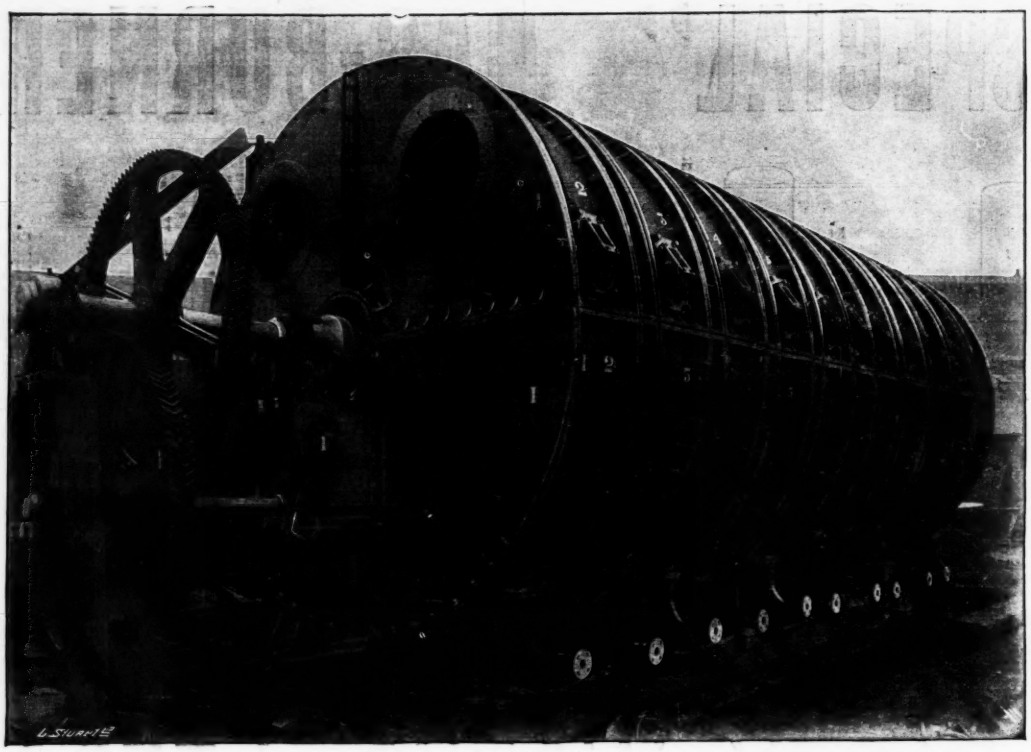
PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

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NOTE: Orders already received in

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For **MACHINES** to deal with

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CUBIC FEET OF GAS PER DIEM.

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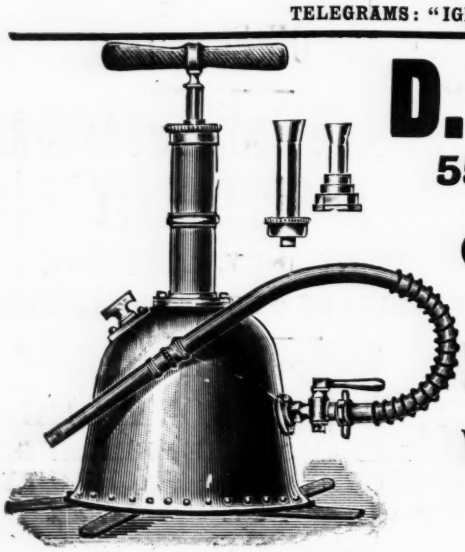

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GAS SERVICE CLEANSERS.

LAMP TORCHES.

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WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

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"ACME" GAS STOVE WORKS,

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No. 1082.

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GOOD GAS FIRE.

THE

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IS THE BEST.

Order Sample.

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SPECIAL BRICKS and BLOCKS of every description for GENERATOR and REGENERATOR FURNACES.

"ABC" Code and UNICODE used for Telegrams and Cablegrams.

Large Stocks of Bricks of all sizes, Burrs, Boiler Seating Blocks and Covers, Plain and Rebated Tiles, &c., &c.

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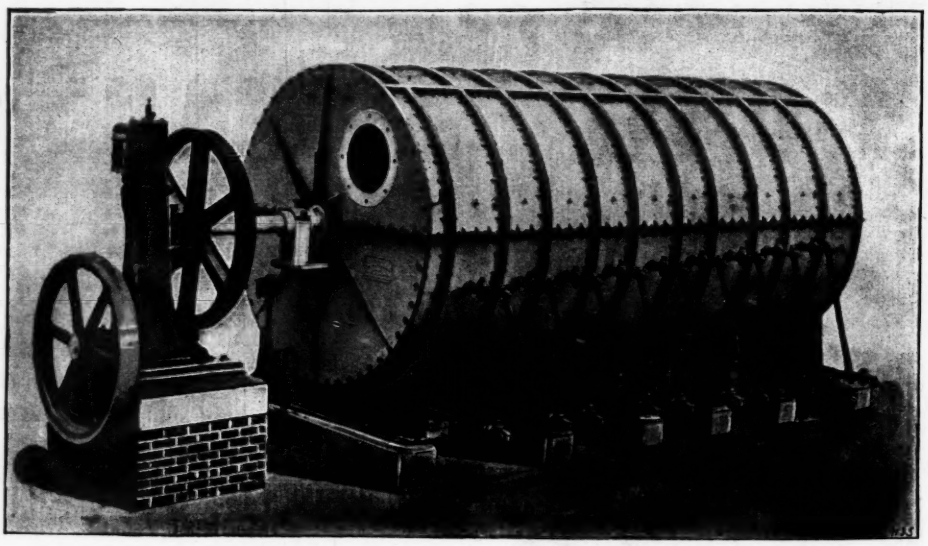
PATENT "STANDARD" WASHER-SCRUBBERS

Complete Extraction of Ammonia and large proportion of CO_2 and H_2S.

Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



Old Pattern Machines fitted with latest Improvements at Small Cost.

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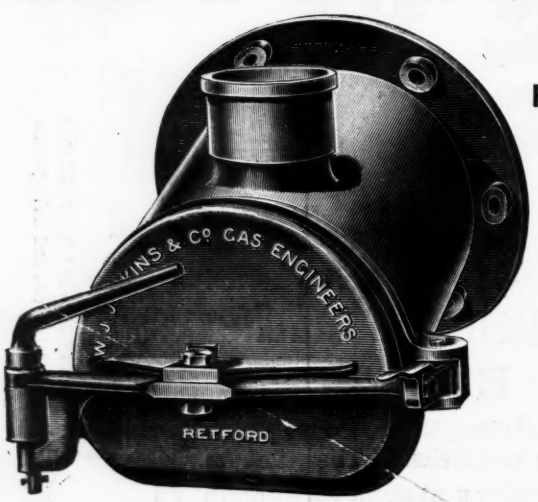

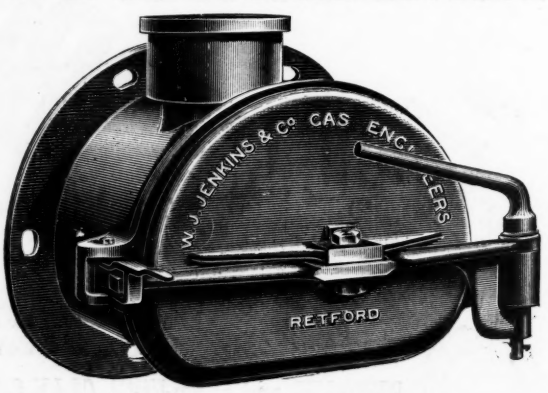

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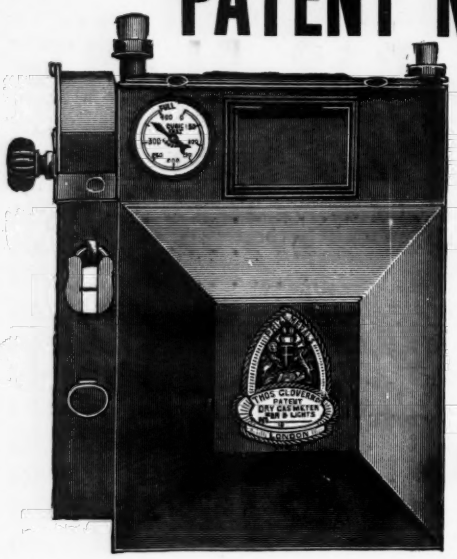

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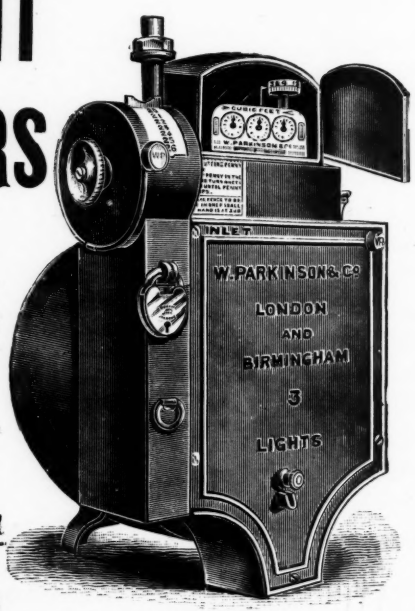

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EDITORIAL NOTES.

Prospects of Union in the Gas Industry.

It is not all war, and rumours of war, even in these days. In our "Correspondence" columns to-day will be found a pleasant communication exhibiting Mr. J. W. Helps and Mr. A. Dougall joining hands and waving an olive branch with grace and vigour. To be plain, these representatives of the Institution of Gas Engineers and the Gas Institute unite in reporting substantial progress for the movement in favour of bringing about a fusion of these organizations. Few readers of the "Journal" who desire the good of the gas industry, and of those who live by it, will receive this intelligence otherwise than with favour, and even with gratitude. Those moving spirits on both sides who have been so far instrumental in carrying the matter to the promising stage of a Joint Committee deserve heartiest congratulations upon their tact and perseverance. It is unnecessary to recapitulate all the influences and circumstances which, taken altogether, went to show that there was no longer anything in the way of a reunion of the members of the professional side of the gas industry, and further indicated the desirability of such a consummation. Suffice it to acknowledge that the time had ripened for turning over a new leaf of the history of the technical associations connected with the British gas industry, and willing hands were found to assist in the operation.

Preliminaries having so far been arranged, we can perhaps encourage those who hesitate on the edge of the next stage by appealing to all who may be concerned to regard the turned leaf as closed for ever. Let bygones be bygones, for the sake of the future. The most hopeful spirit for the Joint Committee and their supporters to receive will be that of desiring to make a fresh start altogether, only remembering the past in order to avoid its errors. Since our correspondents mention the subject, there can be no harm in laying stress on the guiding principle that, in framing the constitution of the new Institution, it should be reserved, as far as possible, for those belonging to what we have already distinguished as "the professional side of "the gas industry." This leading rule should be sufficient. If it is kept in the forefront in the drafting of the Articles of Association, and acted upon in the spirit by successive Councils, the organization cannot go far wrong. For this reason, chiefly, it would seem preferable to retain the title of the Institution of Gas Engineers, as being in line with other modern technical organizations, such as the Institution of Electrical Engineers, which imply a professional, individual, or personal qualification in the members. The word "Institute," as in the example of the Iron and Steel Institute, appears to belong more appropriately to an organization possessing more of the attributes of a trade society. This was, indeed, the idea of those who gave the Gas Institute its name; but the plan has not worked well in this instance. If for no other reason, the profession and the trade of the gas industry are too large to be combined in one "show" for comfort, especially if it is to be a travelling one. Of course, there will be occasion for boundary disputes; it being difficult sometimes to draw the line between candidates for membership with diversified qualifications. But this difficulty, such as it is, is not peculiar to one kind of Society, and is rarely insuperable by goodwill and common sense. One has to keep one's mind clear from cant in this regard, as in many other practical problems of social life. Speaking in the broadest sense, all professional men are traders, inasmuch as they are in their callings for a living. Gas engineers are not as astronomers, or persons mildly interested in psychical research. It is not for them to sniff disdainfully at a "trader;" nor do they, to our knowledge. Those who object most strenuously to the participation of commercial men in their technical gatherings do so not for the reason that the latter are in any sense their inferiors, but only that their interests are different. Every gas engineer and gas manager, for example, is interested in the puzzle of naphthalene; but this cannot interest the gentleman who sells tubes. On the other hand, when it is a question of the best practice in gas distribution, the tube maker may be helpfully taken into counsel for the sake of the knowledge that he must have of the best value to be had for money spent upon his speciality.

After all, the issue lies in the hands of the individual followers of the profession. If they are truly persuaded

of the advantages of the periodical assembling of themselves together, for mutual assistance and support in plodding along the highway of life, they must agree that it is better to have one company than two. Men who are like-minded can find one another in any crowd, but not in two distinct collections separated by time and space. Every gas engineer and manager ought to belong, as of right, to his national technical society, which should be supported with discriminating liberality by the gas proprietary interest, and be the focus of technical instruction for those who are learning the business. In addition, every full member should acknowledge his obligation to do all in his power to raise the organization to the highest pitch of authority and credit possible for its nature and origin. This is to be done, not merely by contributing papers of real value, and discussing the papers of others with candour, fairness, and an honest desire to spread the truth—although this is the first essential to the success of a technical society—but also by setting and upholding a high standard of professional and social conduct. Those who go to a society meeting for the sake of advertisement, or as to a beanfeast, are much better away, whatever their nominal qualifications. Within the ranks of such a calling as that from which the membership of an Institution of Gas Engineers must be drawn, there will always be men of many minds and of various tastes; and a dead-level of professional demeanour is not to be desired, even if it were attainable. Most probably—be it said with bated breath—even the Association of Head Masters has moments of unbending! Enough on this head, however. We heartily wish all success to the Joint Committee; and have every confidence that, in the hands of such worthy and capable men of affairs as Mr. Dougall and Mr. Helps, the matters at issue will be guided to a happy solution.

The Report and Accounts of the Gaslight and Coke Company.

THE report of the Directors and the statement of accounts relating to the working of the Gaslight and Coke Company for the past half year have been issued. The general meeting of the Company is convened for Friday next, the 2nd prox. The report states that the profit balance available for distribution amounts to £560,663, out of which the Directors recommend the payment of a dividend on the ordinary stock at the full statutory rate of £4 18s. per cent. per annum, which will leave the sum of £193,333 to be carried forward to the credit of the current six months. This remarkable improvement is due to several causes. Prominent among these is the material increase of gas consumption for the half year, which attained the rate of 4·92 per cent. Some observers would declare that this is a case of "one man's poison being another man's meat," and refer it to the shortcomings of the electricity supply undertakings in the Company's district. Nor should we say that this notorious defect of the rival illuminant was a negligible quantity in the influences bearing upon the Company's fortunes. Residuals have likewise helped the Company greatly; their income from this source having risen by £110,090. These are big figures, and they will be taken to amply justify the reduction in the price of gas by one penny per 1000 cubic feet, which came into force at the beginning of the year. For the immediate future, on the other hand, the condition of the coal market, both as regards supplies and prices, is justly mentioned as a cause of anxiety to the Directors. Happily there has been no actual shortage of coal at the Company's stations, although the stocks were seriously depleted; but higher prices are regarded as inevitable.

In regard to their parliamentary programme, the Directors content themselves with stating that the provisions of their Bill are in all respects identical with those of the measure which the House of Commons accepted last session. The negotiations between the Company and the Directors of the South Metropolitan Company relating to the possible transfer to the latter of the Surrey-side district of the Company are mentioned in a special paragraph of the report. It is admitted that there is at present an immovable difference between the two Boards in respect of the value of this property, "and there the matter "for the present rests." The circumstance of the Bill actually being promoted by the South Metropolitan Gas Company containing an application for permissive powers for making this purchase, is very properly described as providing further opportunities for discussing the whole subject. In another paragraph, this South Metropolitan Bill and the Bill of the London County Council for further regulating the testing of the gas supply of London are characterized as requiring very careful watching on the part of the Directors, "with a view to safeguarding "the interests of the Company." And there an end. Nothing is said concerning the recommendations of the Powers of Charge Committee, which were presented too late to be mentioned in the last report.

The accounts show that the net capital expenditure of the Company was £75,834 for the half year, mostly on distributing plant. The increase in gas-rental has already been noticed. It amounted to £62,869 in money. The rise in residuals was from £371,337 to £481,427. Altogether, the Company's revenue rose from £1,912,785 to £2,088,220. On the other side of the account, the expense of gas manufacture rose from £1,016,690 to £1,133,843. Repairs and maintenance are well kept up. The other entries do not call for particular remark. Economies have been effected in some departments; and in the matter of workmen's compensation, a change would appear to be in progress from a computed to the actual charge. The undertaking has had a prosperous and uneventful half year, which the able and conscientious officers have doubtless utilized to their best ability in improving the property committed to their care. The suspense account for automatic fittings begins to show a shrinkage. The report states that the opportunity for a change of Auditors has presented itself, in the ordinary course. It is possible that the same occasion may be taken for raising the question of professional auditors; but we have no specific information on this head. The address of the Governor (Colonel Makins) to the meeting is certain to be received with quite the usual meed of interest.

The State of the Coal Market.

READERS will not require any apology from us for reverting to the question of the dearth of coal. It is at present *the* topic of the hour, and is, moreover, a cause of constant anxiety in the gas world; while in the Press generally, in spite of the absorbing interest of the news—or, as often as not, the lack of news—from the seat of war, the scarcity and high price of coal are attracting attention, and are being made the subject of more or less instructed comment. In spite of the open weather that has prevailed for some time past, the situation, so far at any rate as the leading Gas Companies are concerned, shows no sign of appreciable improvement; and, in view of the depleted condition of the coal-stores at the end of the year, it is pretty certain that the Metropolitan gas managers are thanking Heaven for the absence of frost and fog as fervently as they are cursing (in parliamentary language) their contractors for the absence of coal. The situation in London at the end of December, and the possibilities of the situation in January had maximum gas consumption prevailed, can be gauged from the stock of coal on the last day of the year shown in the balance-sheet of the Gaslight and Coke Company—namely 161,120 tons, compared with 258,662 tons at the end of 1898. Assuming the Company's weekly consumption in mid-winter at 65,000 to 70,000 tons, they had on the average less than 2½ weeks' coal in stock at their various works at the end of last month, and that in spite of an increased manufacture of carburetted water-gas during the preceding half year. This fact supplies a conclusive answer to the question asked by a correspondent in our columns last week, as to whether buyers relying chiefly or entirely upon seaborne coal supplies were experiencing the same difficulty in obtaining delivery from their contractors as those whose coal should reach them by rail. The passing of the holiday season and the disappearance of fog, without the accompaniment of anything more than a very slight improvement in the matter of coal deliveries, tends to remove from the list of excuses relied upon by colliery owners for their non-fulfilment of contract obligations, that of congested railway traffic.

There are two further suggested explanations for the present state of the coal market which are frequently put forward. The one is that to which we referred last week—the supposed reduction of output due to idleness on the part of the miner. This excuse has been frequently advanced by defaulting contractors to explain their failure to deliver and now the public are being asked to accept it as accounting for the high and rising price of coal. The theory is expounded with considerable humour, but an entire absence of proof or logic, in a letter in "The Times" of Thursday

last, upon "Miners and the High Price of Coal," signed "C. K. F." The writer prefaces his letter by remarking that he has "never seen a collier" himself; but we are disposed to think that his interest in the question may be something more than academic, and his concern less for the general public than for the coal-owner. The "lazy "collier" theory is so very convenient to the over-sold colliery proprietor. The fondness of coal "winners" for a holiday is, of course, a matter of common knowledge, and not a matter of very great astonishment to anyone acquainted with the conditions under which much of the winning is, of necessity, effected. But when it is sought to suggest that the present scarcity, and consequent high price, of coal are due to a more than usually frequent indulgence in this habit of "playing," it is necessary to point out, as we did last week, that, unfortunately for the contractors, the facts do not tally with the theory.

The "Financial Times," in an article entitled "The "Monopoly in Coal," which appeared on the same day as the letter to which we have referred, showed the general public, from the statistics of the Board of Trade (quoted in these columns last week), as we have put it to our readers, that the "idling miner" argument "is ingenious, but that "it is not based on fact." The writer of the article then proceeds to set out his own view of the coal situation, and advances the other of the two explanations we wish to notice. That explanation consists in alleging "the exist- "ence of a powerful Trust in the coal trade," and suggesting that there is no real scarcity of coal. So far as the second point is concerned, if by saying that there is no scarcity of coal in this country, nothing more is meant than that the mines are far from being exhausted, no one will be found to contest the obvious truism; but if the suggestion is that coalowners have got large stocks somewhere concealed, we can only ask for some proof of their existence. In regard to the alleged Coal Trust which is supposed to be almost entirely responsible for the rise in price, we, recognizing the notorious difficulty of proving a negative, can do no more than point out reasons for holding that the balance of probability is against the existence of such Trust.

Foremost among such reasons is the enormous difficulty of creating a combination of the many interests concerned in so vast an industry as the coal trade, sufficiently effective to rule the market and force up prices to their present figures; and, further, could such a combination be successfully brought about, the extreme improbability of such a ring being called into existence, and effectively maintained for months, without the knowledge of the commercial world generally. Again, the fact that the scarcity and dearness of coal are not confined to our own country, but are in fact practically universal, is an argument which proves that, if a Coal Trust exist, the state of the market here is not mainly due to its influence. Germany, Italy, and Russia have been and are all suffering from the lack of coal; while trade in Austria, before the present strike of miners had created a real state of coal famine, was seriously hampered by want of fuel. Is it suggested that the "powerful Trust" embraces all collieries in all countries? Some people can never accept a simple explanation, such as that abnormally active trade for more than twelve months has been sufficient to harden the coal market very considerably; they must always conjure up visions, and seek for occult and sinister forces. We decidedly think the "Coal Trust" is a vision; its existence is certainly as yet "not proven."

More About the Everett Coke-Gas Plant.

THE long and interesting letter of Dr. F. Schniewind concerning the Everett (Boston) Retort-Oven Gas Plant which appears in to-day's "JOURNAL," taken in conjunction with the article we reproduced last week from "Progressive "Age," brings down to the latest date the available technical information relative to this highly interesting experiment in gas manufacture. Dr. Schniewind is quite justified in believing that our interest in this venture is both kindly and earnest. We have no prejudices whatever in regard to the manufacture of illuminating gas, and gladly welcome everything that has any respectable credentials as an improvement upon established practice. The gas industry of the United States has always been liable to revolutions, which have not always proved true reforms. The supersession of the coal-gas supply of the Eastern States, for instance, by carburetted water gas, was not due to technical considerations. The carburetted water-gas interest contrived to circumvent or to oust the old coal-gas interest; and there was the end of it—for the time being. As in the United Kingdom, so in America, carburetted water gas did not succeed on account of its greater cheapness as compared with coal gas. Bulk for bulk, there was little to choose between the cost of the two products as delivered into the holder; but the carburetted water gas was of very much higher candle power than the coal gas it supplanted. Twenty-four candle carburetted water gas cost no more than 16-candle coal gas; accordingly it "went" with the American public. It was as a carburettor that the same product first made its mark here. During the years of this progress, however, something else was going on which tended to redress the balance. American gas oils did not grow more plentiful, nor cheaper; and the incandescent gas-light knocked candle power into a myth. The Age of high-grade gas passed away. Boston, having been captured by the water-gas interest, had retaliated by enslaving the water-gas capitalists in turn. Having laid down their plant, they had to make the best of it, which meant that the price of gas must be kept up to accord with the high illuminating power. The one was the sole excuse for the other. On top of this artificial position of the Boston gas industry came the Everett enterprise, with an offer of coal gas at considerably less price than the water gas cost to make. Dr. Schniewind says the venture is justifying itself. We are glad to believe him. There is nothing in his letter to disturb our first impression that, as compared with gas *plus* coke making, coke *plus* gas making is merely change for a shilling. It is different when the competition is with carburetted water gas; and Mr. A. C. Humphreys has already admitted that the latter has been overdone in America. The chief question is, of course, what is the natural and economic system of gas manufacture for every locality. The water-gas speculators have declined to recognize the economic frontiers of their realm; and they are consequently threatened with the loss of the provinces they ought never to have occupied. Our readers must form their own opinion as to the financial dealings so lightly touched upon by Dr. Schniewind. Personally speaking, we should dearly like to take the trip to Boston and spend a few days in company with our respected correspondent and his financial chiefs, Mr. Whitney and Mr. Elkins. Such an experience would be a liberal education; but the "JOURNAL" imposes ties which must not be broken, even on such a temptation. Meanwhile, we shall continue to follow the fortunes of the Everett undertaking with the liveliest interest, and the sincerest admiration for that individual enterprise which, as Dr. Schniewind well says, cannot flower freely in the stifling atmosphere of State Regulation and rampant Municipalism.

The Labour World in 1899.

WE print elsewhere summaries of the preliminary statistics issued by the Board of Trade relating to industrial disputes last year and the changes in rates of wages and hours of labour reported during the same period. For the final and elaborated returns the world must wait the pleasure of the Department, which has an unlimited faith in the virtue of making haste slowly. It is, indeed, only a few weeks since we noticed the appearance of the annual report on trade disputes in 1898. In some respects the preliminary summary possesses an advantage over the final, inasmuch as we are told that one of the chief causes of the delay in publishing the latter is the length of time required to obtain all the particulars of the minor disagreements between employers and employed—disputes the facts of which, however interesting and important to those directly concerned, tend rather to confuse than to enhance the value of the statistics relating to those conflicts which afford a real indication of the relations existing between the bulk of employers and employed.

The past year was singularly and happily free from any serious disturbance of the peace in the industrial world. The number of days lost through strikes or lock-outs, as compared with those in 1893—the "black year" of modern times in this regard—was in the ratio of 1 to 12½, and less by 30 per cent. than in 1896, which was itself especially free from trouble. Of such disputes as did arise, the great majority were in respect of wages, while less than 3 per cent. arose over hours of labour—a pretty accurate indication of the preference of the working man for better earnings rather than more leisure. Only something under 6 per cent. of the hands involved struck work over the

"employment of particular classes of persons," which is a more euphonious description of the strike against non-union labour—a cause of trouble which it is to be hoped will continue to be, as it has been of late, less prevalent than formerly. We wish we could infer that the comparative freedom from serious disputes that the community has enjoyed since the trouble in the engineering world in 1898, was due to some more abiding cause than the flourishing condition of trade. We hope (though not too confident in our optimism) that the history of the engineers' dispute may have been an enduring lesson to employees generally, that extravagant unreasonableness may prove its own undoing, by calling into being the latent power of combination possessed by employers.

That the working classes have obtained a fair share of the advantage accrued to commerce by the revival of trade is evident from the report as to changes in wages last year; those changes being, with insignificant exceptions, in the nature of increments of a substantial character, affecting large numbers of hands, and obtained in 97 cases out of every 100 without any strike or stoppage of work. Wages have, in fact, been moving steadily upward now for several years; the turning-point being about the latter end of 1895. Last year and 1898, however, witnessed the most striking advance; the movement synchronizing with the steady improvement in trade. This rise in wages has been most marked in the coal and iron trades, which have been more especially flourishing, and in which rates of wages are made to depend, more or less exactly, upon current prices. Signs are not wanting, however, that coal miners are by no means satisfied with the advantage they are gaining from the present abnormally high prices of coal. As these prices cannot, in the nature of things, be long maintained, it is doubtful whether employers will willingly grant the rise in wages now being demanded. But it is earnestly to be hoped that the condition of the coal market will not be aggravated by labour disputes.

Defer to the London County Council.

It must be a blessed and a happy state to be a convinced and accepted "Progressive" in the minor political world of London. No more painful balancing of the rights and wrongs of things; nothing to disturb the equanimity of a mind firmly based on the immovable rock of faith in the London County Council! What are Parliaments, and Royal Commissions, and Government Departments in the balance with this repository of every civic virtue and all wisdom? We can see the operation of this municipal form of Mohammedanism in the reception accorded by that organ of the faithful, the "Daily News," to the report of the Royal Commission on the London Water Supply. It was graciously conceded that the Chairman of the Commission, Viscount Llandaff, "is an extremely "clever and accomplished man." But—it is an awful "but"—he lacks the "judicial mind," and entertains "a violent prejudice against the London County Council." Wherefore, away with him! It is the only possible way of municipal salvation to hold the most insensate of prejudices in favour of the body which Lord Rosebery once led—but to which he denied a palace in Westminster—and is now supposed to be illuminated chiefly by the ripe wisdom and experience of Messrs. John Burns, Sidney Webb, and Co. The Commission find that the other Authorities interested in Water London have no faith in the London County Council; and accordingly they propose a Water Board, such as many populous centres know already. But this "flimsy" excuse the "Daily News" brushes away as of no account. What are the County Councils of Hertfordshire, Middlesex, or Surrey that they should presume to object to the ineffable magnates of Spring Gardens? As in water, so, of course, in gas, tramways, everything—there must be no shadow of resistance to the London County Council, on pain of the greater damnation. Yet we remember that not so long ago there were people, not outcasts like Water and Gas Companies, who held the opinion that the Council was not wholly justified in its policy towards Sunday Concerts and Lord Rowton's Houses. Naturally, these were much more important questions than the water supply of the Metropolitan area, or the gas either. But oh! to be a "Progressive," with no obligation to have one's own opinion about any of these things! Blessed Authority, which is always ready to relieve the world of thought for itself. We have no Czar nor Pope in this Land of the Free; but we have more than one County Council.

WATER AND SANITARY AFFAIRS.

In another part of the "Journal" will be found the first instalment of our abstract of the final report of the Metropolitan Water Commission, a general outline of the contents of which, with the principal recommendation, was given last week. In view of the extent to which the questions referred to the Commission have been from time to time discussed in the Press, it has been thought to be of interest to reproduce some of the opinions which the publication early last week of the long-expected report called forth, and, in common fairness, to record, in connection with them, the views which have been orally expressed by members of the party known to be hostile to the Water Companies. We leave the abstract and the comments to the attention of the general reader. Those who are specially concerned with the subject-matter of the report will, of course, study the original document. The Commissioners, as is now pretty widely known, recommend the constitution of a representative Water Board to acquire and carry on the undertakings of the Companies; and it will be seen that the majority of the Press approve of the recommendation. There are necessarily some differences of opinion as to the proportion of the representation, and other matters; but, broadly, the proposal is accepted as the best solution of a difficult problem. And we may add that satisfaction is generally expressed that the London County Council are not to be entrusted with the control of the water supply. For ourselves, we have consistently expressed the opinion that if it is to be taken out of the hands of those who have been for so many years responsible for it—and we have never admitted any necessity for such a step—it should be handed over to a permanent body specially constituted for the purpose, and not to the County Council. Several reasons might be adduced here in support of this opinion; but we prefer to let those given by the Commissioners in their report speak for themselves. Just one, however, may be noticed. It is this—that the area of what has become known as "Water London" is larger than that which is under the jurisdiction of the Council. Unless the outer areas were lopped off, the powers of the Council would have to be extended; and such extension would meet with strenuous opposition from the Local Authorities concerned, who certainly have not manifested a desire to be under the supervision of Spring Gardens. When this question of the control of the Metropolitan Water Supply was taken up by the Government four years ago, we ventured to suggest that the only appropriate authority to be entrusted with it would be one representing the interests of the whole of the consumers who are dependent on the Water Companies; and that to such a body the undertakings might be transferred. We considered that little friction would be experienced in effecting the transfer, provided the terms of purchase were fair and equitable; but that the public and the general body of consumers would be any better off by it, we ventured to doubt. We will leave our readers to judge how far these views accord with those expressed by the Commissioners in their report.

It may very fairly be asked: Why, except as a concession to Municipalism, should the water undertakings be transferred to a public body? There are people—and they have their representatives on the County Council and their spokesmen on the Press—who will reply: Because the owners of those undertakings purvey an unwholesome commodity, are extortionate in their charges, and neglectful of their duties to the public. The injustice of such assertions is fully shown in the present report as well as in that of Lord Balfour's Commission of 1892-3. The latter body expressed the strong opinion that the water supplied to the consumers in London was of a "very high standard "of excellence and of purity," and "suitable in quality "for all household purposes." Viscount Llandaff's Commission say that "the Companies have, upon the whole, "performed their duties to the public satisfactorily and "well." There is no reason for supposing that they will not continue to do so if they are left in possession of their property. But if they are to be bought out, it must be at a fair price; the owners not being willing sellers. The views of the Commissioners on this point, as will be seen from our abstract of their report, are clearly expressed. They see nothing which would lead them to suppose that Parliament will sanction any exceptional provisions, or "depart from the terms of arbitration usual where the

"property of private persons is taken from them against "their will." Consequently, away go all the attempts to depreciate the property of the Companies with the view of getting it at some "old iron" price. Whatever the figure is to be—whether £30,000,000 or £45,000,000—it will have to be determined by an arbitration conducted on the lines of the Lands Clauses Act, but with possibly a different tribunal, in view of the magnitude of the undertakings. We agree with the "Pall Mall Gazette" that the constitution of this tribunal is the *crux* of the whole question. Its President will have to be a man who will command confidence; and he must have the assistance of legal assessors. But the right man will be found when the time comes for seeking him.

In less than ten years the London Water Companies have had to bear the expense, and their Directors and responsible officials the anxiety, of two long investigations into their affairs by Royal Commissions. They have passed through both ordeals with honour. Some of them have been before Parliamentary Committees, and one has been the subject of a special inquiry by the Local Government Board. In spite of persistent opposition, they have been able to hold their ground. But for this opposition, their works would to-day be in a better condition than they are for meeting the demands upon them. Where public companies are subject to continual attacks from without, the energies of their conductors are spent in repelling them, instead of being directed to the perfection of internal arrangements. It is to be hoped that the outcome of the protracted inquiry by Lord Llandaff and his colleagues will be a definite settlement of the Metropolitan Water Question. It has been objected that the Commissioners advise the addition of one more to the numerous controlling authorities now existing in the Metropolis, instead of handing over the water supply to the Local Government Board, or to a specially created Public Health Department or National Water Board. But it should be remembered that, under the Commissioners' scheme, the Water Board will be to a large extent subject to the supervision of the Local Government Board, and will be also responsible to Parliament. Should either or both of the other suggested bodies be created—and, in view of the present scramble for watershed areas, some such organization as that last named appears to be needed—there would not be much difficulty, we should think, in incorporating with it the Water Board which it is now proposed to constitute.

In view of the incursion of large numbers of visitors into Paris during the coming summer, attention is being given to the question of the supply of potable water by the Technical Commission who have been entrusted with this matter. Last year, notwithstanding the very hot, dry weather which prevailed, the normal supply of 48½ million gallons of spring water was found to be sufficient. During the present year, however, there will be an addition of some where about 17½ million gallons from new springs, and 4½ millions from the St. Maur filters. The daily supply will thus be raised to 70½ million gallons. Irrespective of this, there will be in store 22 million gallons at St. Cloud, and 88 millions in the other municipal reservoirs. These stores will, of course, not be drawn upon until necessity compels it; but when they are, there will be available 100 million gallons of water as an auxiliary supply. During the drought of last summer, some alarm was felt lest an inadequate supply of spring water should militate against the success of the Exhibition by deterring strangers from visiting the city, or hastening their departure from it. It would seem that the municipal authorities have taken steps in time to ensure the efficiency of this most important service; and it is to be hoped the provision they have made may prove ample. A dearth, or even a short supply, of water in a city like Paris, in the full tide of the Exhibition, would be really deplorable.

While referring to Paris, it will not be out of place to notice the appointment of a Commission to investigate the subject of the divining-rod as an aid to the discovery of sources of water. Their duty will be to ascertain, by studying both scientifically and technically, the methods now employed, apart from the application of geological and hydrological knowledge, their value for locating subterranean water. The President of the Commission is to be M. De Rollière, a Consulting Engineer residing at Neuilly, near Paris, who is already known, at all events in France, by his works on hydrology. On him will devolve the collection of materials and information, which will be dealt with at general sittings of the Commission. It is to be hoped that the outcome of their labours will be to throw light upon a system as to the merits of which opinions are by no means unanimous. If there is any scientific value in divination, it will stand the test of investigation; if, however, it is little more than a piece of jugglery, the sooner the trick is exposed by some authoritative pronouncement the better.

THE STEVENSON MEMORIAL.

Our readers will doubtless remember that, on the initiative of Mr. H. E. Jones, Engineer and Manager of the Commercial Gas Company, preliminary steps were taken last November to form a Committee to consider the advisability of the erection by the gas profession of some memorial to the late Mr. George Ernest Stevenson. It was felt, however, that it was hardly possible to get together anything like a representative gathering of gas engineers just as the very busiest time of the whole year for them was so nearly approaching. The matter has, however, not been allowed to lapse; and Mr. Jones has now issued a circular of invitation to all those who responded to his original suggestion, asking their attendance at a meeting to be held next Friday at the Westminster Palace Hotel, at 4 o'clock—"for the purpose of considering the form the memorial should take, what limit (if any) should be put on the subscriptions, the disposal of any possible surplus that may result, and further for the election of a Working Committee for carrying out the objects of the meeting." Mr. Jones trusts that all who sympathize with the movement and are able to attend the meeting will do so, without further personal invitation; but if unable to be present, that they will write before Friday stating their views on the points raised, and also what contribution to any fund they are disposed to give.

Society of Engineers.—The first ordinary meeting of this Society for the current year will be held at the Royal United Service Institution, Whitehall, next Monday, when the retiring President (Mr. J. Corry Fell) will present the premiums awarded for papers read during the session of 1899, and his successor—Mr. Henry O'Connor, of Messrs. James Milne and Son, Limited, of Edinburgh—will deliver his Inaugural Address.

Southern District Association of Gas Engineers and Managers.—The first meeting of this Association for the current year, which, under ordinary circumstances, would have been held on the 8th prox., has been postponed till the 1st of March; the Committee being of opinion that, as the second Thursday in February falls so early in the month, and as the present season is an exceptionally heavy one, it would be inconvenient for the members to attend on that day.

The Proposed International Gas Congress in Paris.—With reference to the particulars in regard to this matter which appeared in the "Journal" for the 16th inst. (p. 140), we may remind our readers that the Organizing Committee, of which M. Vautier is Chairman, will be glad to be advised by the 15th of February, if possible, of any intention entertained to present communications to the congress to be held from the 3rd to the 5th of September. M. Vautier's address is 65, Rue de Provence, Paris.

Institution of Mechanical Engineers.—The annual general meeting was held in the new Institution House, Storey's Gate, St. James's Park, last Friday. At the commencement of the proceedings, Sir Edward H. Carbutt (who presided in the absence of the President, Sir William H. White, K.C.B.) made the gratifying announcement that they had had a considerable accession of new members since the last meeting. The Secretary (Mr. Edgar Worthington) then read the annual report of the Council, which stated that, at the end of last year, the number of names in all classes on the roll was 2922—a net gain of 238 during the year. The total revenue for the year was £8777; while the expenditure was £9230—leaving an excess of expenditure over revenue of £453. The past year is the first in which the Institution have occupied their own house; and an increase in the expenditure was inevitable. Certain expenses of a special character had also to be incurred in connection with the opening of the house. Under these exceptional circumstances, the financial result of the year was considered satisfactory. The expenditure to Dec. 30 on the new building amounted to £59,214. The report was unanimously adopted; and the Chairman then announced that Sir William White had kindly consented to accept the position of President for the second year. The plaudits of those present demonstrated the popularity of Sir William. The Vice-Presidents and other office-bearers having been elected, Mr. William Schönheyder read a paper on "Water-Meters: With Special Reference to Small Flows and Waste in Dribbles." The principal portions of the paper, with a summary of the full discussion which followed, will be published in next week's issue.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 283.)

Business on the Stock Exchange cannot be reported to have improved last week, so far as any increase in volume is concerned. Rapid fluctuations were the rule. After a fairly firm opening, things turned rather shaky, and railways in particular lost some ground. Then there was a recovery, which became more pronounced when it was apparent generally that the fortnightly settlement was not likely to give rise to difficulties. On Thursday, everything jumped up at the receipt of good news from the seat of war; but the rise was tempered by a strong disposition to realize profits. The next day there was marked depression on the news of the abandonment of Spion Kop; and the week closed flat. Prices all round have suffered generally, although here and there special circumstances have operated the other way. The Money Market continued to become easier; and the further reduction, on Thursday, of the Bank of England rate to 4 per cent. from the 4½ per cent. (which had lasted a week) became inevitable. Business in Gas was on the whole decidedly quiet, beyond what was done in the issues of the leading Company. The general tendency was favourable; and a fair number of quotations made moderate advances, while the movements in the other direction were few and unimportant. In Gaslight issues, the ordinary opened rather too buoyant, jumping at once to 110—a price which had to be modified later on; and though 110½ was touched at one time, the closing mark was a point lower. The quotation, however, had gained a point-and-a-half. This was owing to the issue of the report and accounts, which certainly found favour. The secured shares were not much dealt in; but the maximum and the debenture improved. South Metropolitan was rather quiet, and not disposed to go any higher. Commercials gave no sign of movement. Transactions in the Suburban and Provincial group were rare, and movements were irregular, comprising an advance in Brightons, and a retrograde move in Crystal Palace. In the Continental Companies, transactions were much restricted; but there was a rather firmer feeling in Imperial Continental. Among the minor undertakings, Tuscan had a fall, but River Plate rose. Business in the Water Companies was not quite so near the stagnation point; and there were a few movements in quotations. But they were slight in degree, and variable in direction.

The daily operations were: Business opened quiet on Monday, but with a very good tendency. Gaslight ordinary rose 1. There was a shade more activity on Tuesday; quotations remaining unchanged. Wednesday's operations were slacker; but the general disposition was firm. Brighton original rose 2½, and the ordinary 2, and Imperial 1. In Water, Lambeth advanced 1; but New River fell 2. Thursday was a little busier, and showed renewed strength in Gaslight ordinary, which gained ½. River Plate debenture went up 1; but Crystal Palace fell 3, and Tuscan ½. Friday was active and buoyant. Gaslight maximum and debenture rose 1 each. In Water, East London moved up 1½. On Saturday all was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

Electric Traction on the Metropolitan Railways—The Difficulty—The Requirements—The Apparatus—Wanted, A General Manager of Town Lighting

Some interesting information has at last leaked out respecting the progress of the preparations for the crucial trial of electric traction on their system which the Metropolitan and Metropolitan District Railway Companies are known to have in hand. There are two aspects of electric traction, as of electric lighting, which are respectively regarded by electricians and by mechanical engineers who have not been infected by the electricity microbe. The view of the professional electrician is that the time is past for questioning the applicability of electricity to any and every purpose, from propelling railway trains to heating shaving-water. The only question he permits is as to the interval that must be allowed to elapse while steam and gas-fittings are cleared away to make room for the electrical apparatus. As Mr. Hammond told the Dublin City Council the other day, the disappearance of gas from the streets of Dublin is only a matter of time; and Mr. Hammond is a typical prophet of electricity. Cold-blooded mechanics, on the other hand, who have been brought up to the trade, have a hard-headed way of treating electricity as a mere tool, with strict reference to its suitability for any particular work. Consequently, in the hands of English mechanical engineers electricity has to justify itself at every turn; and the ardent electrician chafes at this callous requirement. He wants to feel himself flying on the wings of progress, with his prophet's mantle streaming behind him; but the British mechanic has no faith in flying machines as a general thing.

We have lately had occasion to lay stress upon certain experiences of users of electric lighting which appear to indicate that, with all its charms, this method of illumination has not outgrown its constitutional weaknesses. In discussing electric tramways, we have also urged time and again that in this matter British highway authorities had better "make haste slowly;" and now it transpires that there is no immediate prospect of the abolition of the steam locomotive from those mephitic tunnels of the Metropolitan Railways whence its departure is most heartily desired by the travelling public. The conclusion of a "Times" article on this subject is that some time "in the course of next century it may become possible to travel round the Circle by electricity." This is remarkably cold comfort to those who "remember how often an electric locomotive was paraded in fancy by Sir Edward Watkin before the expectant eyes of the Metropolitan shareholders, and how regularly it failed to put in a concrete appearance upon the railway." The truth of the matter is that, notwithstanding the vapourings of the electrical prophets, those who are responsible for the working of a great railway know well the seriousness of the business, and how very doubtful it is that electrical engineering is as yet sufficiently advanced to cope with the requirements of full-sized railway service. A general manager of a railway has to think of everything necessary to the continued working of the line; and he has too much reason for knowing what infinite importance attaches to the multitudinous trifles that the would-be innovator from outside naturally overlooks.

It cannot be said that the joint railways interested in this experimental research fell into the error of entrusting the inquiry to unbelieving hands. The Companies employed Sir W. H. Preece to overlook the electrical part; and if anybody could make an electrical train go, one would think the late Chief Electrician to the Post Office is the man. Sir J. Wolfe Barry, representing strict engineering orthodoxy, was associated with the Electrical Knight in this inspiring enterprise. The result up to the present time is described in "The Times" for the 24th inst. Of course, the object of the experiments was not to ascertain whether railway trains could be propelled by electricity at a considerable rate of speed. No fresh proof of this was needed, after what is done every day in London and elsewhere. But what was required was trustworthy data as to the engineering and economical conversion of a steam to an electrical railway under the conditions prevailing in actual practice, having due regard to the keeping of the capital outlay within reasonable bounds and to the subsequent working. Nobody could say for certain how much power would have to be provided to work a section of full-sized railway on an electrical system. The wildest hypotheses prevailed upon this point, down to the opening of the Waterloo and City Railway, which is but a tramline. It is a *sine quâ non* that every railway train must be able to start and stop whenever and wherever required, and travel between its stops at any speed desired by the driver, up to the maximum. Upon this head alone, to say nothing of others, no certainty existed.

The line selected for the experiments is that which runs direct from Earl's Court to High Street, Kensington. The length is nearly a mile; and there is the steepest gradient in the whole system in one section of it. The continuous conductor is of bonded channel iron, fixed parallel to and outside the metals. The current is of 500 volts potential, according to a now pretty well-established rule for traction currents, provided by Belliss-Siemens generators. There would be no difficulty in obtaining any amount of motor electricity at this pressure, transformed from high-voltage main supplies generated at one or more riverside stations. The train picks up the current by means of sliding contacts, which need make a pretty good connection, as the experimental train weighs 200 tons. It must be rather severe work, transmitting the current for driving such a train through so temporary a contact. With regard to the results of the working, there is as yet nothing to be said. The train will run; and where one train runs others can follow. But this by no means proves that it will be worth while for the Metropolitan Railway Companies to scrap their steam locomotives and take to the "slippers." Some positive gain will have to be shown to warrant the change; and this is precisely where the shoe pinches the electrician. Mere improvement of the atmosphere of the Inner Circle Railway will not suffice to turn the scale. The possibility of an accelerated service, so as to make the trains almost continuous, would be a greater inducement than anything else that could be named. If the electrical trains could follow one another like omnibuses on the road, there would be much to be said for the principle.

Meanwhile, it may be remarked how salutary it would be if the supreme discretion of the general railway manager could be exercised by somebody acting, say, as chief of the lighting service of a town! This is a mere fancy, of course; but suppose such an official were authorized to decide whether such-and-such an applicant should have electricity or gas-lighting, having regard to the nature of his requirements. A good deal of disappointment would be spared to those who could fall in with such an arrangement. The officer would say, for instance, to the hospital director, "Electric light for your operating theatre? Nonsense, my dear sir—what you want there is a light you can depend upon. Take gas. Keep electricity for your wards." And so forth. Dreams, idle dreams, for there is nobody to tell us how to run our private trains on the "Railway of Life."

Dellwik's Water-Gas Process for Enriching Purposes.—A water-gas plant on the Dellwik-Fleischer system has been in use for some months at the town of Iserlohn, in Westphalia, for the production of water gas, which is subsequently carburetted with benzol, and used for supplementing the town supply of coal gas. In the daytime, about 30 per cent., and at night 25 per cent., of this carburetted water gas is added to the coal gas.

GERMAN VIEWS OF GAS PHOTOMETRY.

When the subject of gas-testing in Germany is approached, it immediately appears that there is much diversity of method in the photometrical practices of the great cities. In respect of the gas industry, Germany and Austria are one. There is no photometric frontier between Hamburg and Vienna. The first feature to be noticed in German gas-testing is the frequent adoption of the English system, which is the natural consequence of the undertakings in many of the large towns being now or at some period in the hands of English Companies. The Imperial Continental Gas Association has had a great deal to do with the physical enlightenment of Germany; and though the Association has scrupulously sought to adapt itself in all respects to local standards of every order, whenever it could safely do so, yet, in the absence of a settled German rule of gas photometry, it placed its German works under the *régime* of the English Gas-Works Clauses Act, 1871, in this regard. This description must not be taken too literally, of course; but it conveys the correct idea. The Act of 1871 provides for all that is necessary in regard to the testing of 14-candle gas, which is the grade of coal gas usually supplied throughout the European Continent. Accordingly we find the English parliamentary standard candle, Sugg's No. 1 London argand test-burner, and the Evans or Letheby photometer, in every part of Europe. The example of Vienna may be cited in illustration of this observation. The photometrical practice of the Kaiserstadt was, of course, originally established by the Imperial Continental Gas Association; but it has not been departed from since the Municipality set up in the gas business for themselves.

According to the regulations yet in force, the minimum illuminating power of Vienna gas is 14 English standard spermaceti candles for 141 litres (5 cubic feet) of gas per hour, burnt in a Sugg's No. 1 London argand. The pressure of the gas at the inlet of the photometer meter must be 1 inch of water. The candles must burn at the rate of 120 troy grains per hour. The average of six readings of the photometer, at 5-minute intervals, is taken as the illuminating power of the gas. Evans's modification of the Bunsen photometer is the legal pattern of the instrument. The examination must be started not earlier than one hour after the lighting of the public lamps, and not at any other time, and must be completed in half-an-hour. These tests are made once a week, at stations fixed by the Municipality, where the gas is delivered to the apparatus by a special service pipe (unmetered). There is no staff of gas examiners, the duty coming within the ordinary routine of the municipal administrative staff who look after the public lighting generally.

The Vienna gas is tested by acetate of lead paper for sulphuretted hydrogen. The results of the tests for illuminating power, purity, and pressure are published in the official notices. The testing offices actually in use are those at the Municipal Lighting Bureau, the Funfhaus Gas-Works, and the Erdberg Gas-Works. Usually the tests show an average illuminating power at these places of from 15 to 16 candles. It is obvious that the tests have reference to the gas actually being sent out at the moment for consumption in the city. The situation of the testing-stations, and the rigid prescription of the time for making the tests, are conclusive on this point. Nothing is said about correcting the photometer readings for temperature and barometric pressure; nor have we any information on the subject of penalties.

Harking back from the east of Europe to the centre, we find philosophic, scientific, and common-sense Germany in a stage of transition as regards gas photometry. At one time, the general standard of light for this purpose was either the English parliamentary standard spermaceti candle, or the so-called German normal paraffin candle. The introduction of the amyl-acetate unit of light at the instance of Von Hefner-Alteneck was loyally seconded by the leading gas authorities of the nation, including Dr. Bunte; and many of the gas undertakings accepted this feeble, delicate, and most troublesome standard of light for their photometrical purposes. The definitive adoption of this standard, however, coincided with the rise of the incandescent system of burning gas for all practical lighting purposes. The German mind saw in this radical change of the method of obtaining light from gas something incompatible with former ideas of photometry as a just means of ascertaining the illuminating value of town's gas. With that emancipation from prejudice—that readiness to drop any tradition, however respectable in its day, that no longer corresponds with the facts, which is so marked a characteristic of the educated German people—the municipalities and gas companies of the Fatherland are quietly letting the ancient photometry die a natural death. Many German cities, from Berlin downwards, now have their municipal gas-works; and the up-to-date gas committees of these corporations are not disposed to hamper their manufacturing resources, nor tax the public irrationally, for the sake of an exploded convention. They see no sense in careful photometry of the luminous argand or flat-flame gas-burner, which is hardly ever used by the public, while the gas is only wanted for its heating power on an Auer mantle. Consequently, and until a new and more rational system of testing the real value of lighting gas shall be evolved, the truly progressive German ceases pretending to care for the old-fashioned photometry.

Pressing circumstances contribute their influence to persuade the frugal, wide-awake Teuton to see the matter in this light. The market for good gas coal—good, that is, in the old-fashioned sense of yielding gas of statutable illuminating power—is as "tight" in Germany as it is in England. Quantities of English North-Country gas coals go to Germany; but most of it wants the assistance of a carburettor if the gas is to stand the strict tests formally enacted for some localities. Rich native gas coal is neither plentiful nor cheap; while there is an abundant supply of raw material out of which an excellent common run of gas can be made. "What *is* the good," says the German, "of going to the trouble and expense of carburetting gas, or of binding oneself hand and foot to suppliers of high-class gas coal, when the people only burn the gas after destroying all its native illuminating power in an atmospheric burner, to heat up an incandescent mantle?" He is not so foolish as to tie himself down to any such moss-grown convention. The portable photometer, costing the gas consumers of London an extra quarter-million pounds sterling a year for the "fancy," may be County Council "Progressivism;" but the wise German has other and better uses for his money.

This is how it works out in the concrete example of the gas supply of Magdeburg, as long ago set forth by Herr W. von Oechelhaeuser. It has been demonstrated to the satisfaction of the Municipality of the place, that conventional "candle power" has no meaning in regard to gas that is to be used in incandescent burners. The present standard of illuminating power for Magdeburg gas is 14 candles; and comparative experiments with this and so-called low-grade gas have demonstrated that, with a certain make of gas testing only to 2 candles by the photometer, the superiority for use with the incandescent burner lay with the latter. We have no information as to how this low-grade and presumably cheap gas was made, but assume that it was a true product of manufacture, not merely common coal gas "let down" by the addition of air. The latter, of course, would be illusory. It is reported, at any rate, that Magdeburg is going for cheap gas; and if this does not glorify the photometer, so much the worse for the photometer.

Other German towns are equally set upon the same course; being similarly able to discriminate between means and ends. For this reason, our inquiry into the ideals and methods of German legal gas photometry comes suddenly and unexpectedly to an end. The German view is that the photometer was a good servant in its day; but it would be a bad master now. Consequently, the instrument is being relegated to the technological museums, together with the various patterns of open-flame, luminous gas-burners that were its fellows. We doubt not that German science will eventually prove equal to the task of producing something capable of taking its place, and answering to its purpose of checking the operations of the gas manufacturer in the interest of the consumer. If this German science, which our own teachers so often tell us to admire and follow, does not do anything of the kind, it will probably be because nothing of the sort is felt to be wanted. After all, it is easy to tell whether an incandescent gas-light is up to the mark or not; and the gas-testing of the future will probably be a development of the chemical side, with the object of keeping down noxious impurities.

We feel that it is useless to carry this inquiry further. There is a world of difference between the classic photometry of France, which has known no change for forty years, and the keen actuality of Germany, where the nimble pfennig is chased through the gas-bill as everywhere else. The circumstance that the price of gas in Paris has remained as fixed as the photometry, should not be regarded as an accidental coincidence. Formalism in science is only a reflection of economic error in industry. From formalism to obscurantism is a mere step. But it is the one step which leads over the precipice. To ignore all the gains of mechanical progress in the name of a fetish is not creditable to the common sense of a nation. The legislative authorization of the portable photometer in England would be a calamity, not only for the immediate penalty it would entail upon the community implicated, but for its consequential injuriousness. Statutory gas photometry is to the gas industry of the United Kingdom what the Man with the Red Flag was to mechanical road traction; and it is not from Germany that countenance will be found for riveting the load of the one upon a generation that has already been delivered from the other.

JOINT-STOCK ENTERPRISE IN THE PAST YEAR.

The "Investors' Guardian" for the 20th inst. furnishes particulars relating to the joint-stock companies registered in the past year. We find therefrom that the number was 4529, with a total capital of £234,687,296, as compared with 4653 and £240,853,504 in 1898. Last year's figures are lower than those for its three predecessors, and our contemporary says the reason can only be conjectured. The war may have had some influence; but it is not thought that even this would have operated to stop the flow of new companies up to November—indeed, several important issues were made late in the year. It is true that the first six months of the year gave £148,855,281, while the July to December figures were only £85,832,015. But this is said to be the usual effect of the holiday vacation; 1898 showing £145,889,428 and £94,964,076 in the respective halves.

An analysis of the companies does not show unusual briskness in any department; and our contemporary finds few points to call for remark. The capital invited for purposes of gas supply amounted to £1,105,700, as compared with £1,107,100 in 1898—a drop of £1400 only; while for water supply, £231,000 was applied for, against £134,500, or a rise of £96,500. For electric purposes, a sum of £11,192,700 was asked for last year, as compared with £3,452,364 in the preceding twelve months. With regard to the supply of raw and other material, the capital required for getting coal was £8,666,500, against £4,473,500; for iron and steel production, £9,372,418, against £6,856,000; and for engineering, £9,037,160, against £12,846,580. For coal, therefore, twice the amount of capital was sought last year as compared with 1898; for iron and steel there was a good rise; but there was a decrease in engineering companies. As far as the public are concerned, the only significant feature of the year was, we are told, the issue of some big "combines" similar to American Trusts. These added some millions to the total. In Scotland, there was a heavier decline than in England; the companies registered last year numbering 333, with a total capital of £13,678,669, against 392, with £20,525,758 of capital, in 1898; while the Irish companies fell from 138, with £3,885,900 of capital, to 114, with £2,198,669. In both cases, the figures are below the average of the last five or six years. So far as the present year has gone, Somerset House has been quieter than usual. What it will be later in the year, our contemporary hesitates to prophesy. He is sanguine enough to think we may reasonably hope that the end of the war will soon be reached, and that it will be followed by healthy speculative activity. Peace would certainly be welcome, for other and far weightier reasons than this.

TRADE DISPUTES IN 1899.

A PRELIMINARY summary of the statistics of strikes and lock-outs in 1899 has been published by the Board of Trade. The figures now available, it is explained, are incomplete to some extent, because the annual reports of Trade Unions, Employers' Associations, and Wages, Conciliation and Arbitration Boards will not be available for some time yet. Moreover, a number of disputes begun in 1899 have not up to the present been settled, and consequently cannot be classified as to the basis of settlement—whether in favour of employers or employed, and so forth. For full details we are asked to wait for the annual report; but as that has a knack of appearing at so late a date as to be regarded as ancient history, we will take the preliminary figures of the Department as affording a fairly reliable indication of the nature and result of the trade disputes last year. In fact, the report now issued specifically states that the additional information required for the full record cannot affect the broad conclusion to be drawn from the preliminary statement—namely, that 1899 was freer from important disputes than any year in recent times.

Apart from the jute-workers' dispute in the Dundee district, which involved 35,000 hands, lasted several weeks, and ended in favour of the employers, there was no dispute involving so many as 10,000 workpeople. That which perhaps attracted most attention was the strike and lock-out of plasterers, which affected 4000 men, and caused an aggregate loss of 200,000 days' work. The total number of employees involved in the 721 new disputes recorded last year was 178,440 (considerably less than 2 per cent. of the industrial population of the kingdom); and the number of days lost thereby was 2,496,358. The lowest number of days' work lost through disputes in any of the six preceding years was 3,746,368 (in 1896), and the highest 31,205,062 (in 1893). Looking at the analysis of the disputes according to the trade or group of trades involved, it is seen that the building trades are an easy first (with more than one-third of the total days lost), the textile industries second, followed by the mining, and then the engineering and shipbuilding trades; while the iron and steel group has, in comparison, an almost clean sheet—a striking testimony to the combined effects of excellent automatic wage-adjusting arrangements, and of great prosperity in the trade. The number of workpeople indirectly affected—that is, thrown out of work at the establishments where the disputes occurred, but not themselves on strike or locked-out—represents no less than 23 per cent. of the total; the percentage being highest in the mining industries, where it amounts to 42, a strike of a small number of men or boys of one class of workers, such as the abortive strike of the enginemen and fitters in South Wales last autumn, being frequently sufficient to disorganize the working of a mine and throw idle the whole of the employees.

So far as the originating causes of the disputes are concerned, we find that, taking the number of hands involved, 68·5 per cent. were fighting on questions of wages (54 per cent. being engaged in a struggle for higher rates); less than 3 per cent. on questions of hours of labour; slightly under 6 per cent. over the "employment of particular classes or persons;" 13 per cent. in respect of working arrangements; and about 10 per cent. from sundry other causes. The disputes resulted favourably to the employers so far as 43 per cent. of the workpeople directly affected were concerned; in favour of the employed in respect of 26 per cent.; 28 per cent. of the hands came to a compromise with their masters; and 3 per cent. were engaged in disputes not yet settled. If the percentages of settlements ended in favour of the masters, the men, or neither party be calculated according to the number of disputes, they appear almost exactly equal—being 31·1, 32·6, and 31·6 respectively; but the correct basis is, obviously, the number of men involved. Otherwise one dispute between a builder and half-a-dozen bricklayers, ending in favour of the bricklayers, might be treated as counterbalancing a struggle like that of the Engineers' dispute in 1898, resulting in favour of the employers—a method which would render the statistics (as statistics are so easily rendered) entirely misleading as to the actual circumstances of the case.

England, and especially the South of England, was last year remarkably free from labour troubles. Of the 178,440 hands rendered idle by disputes, 60,165 were employed in Scotland, 36,552 in Wales and Monmouthshire, and 2878 in Ireland. The northern counties of England accounted for only some 70,000; while in all the southern and western counties, including London, only 6876 workpeople came to loggerheads with their employers. The foregoing are the most important of the particulars as yet obtainable. The chief additional statistics promised us in the annual report—when it may appear—will relate to the proceedings of the various Conciliation and Arbitration Boards last year.

CHANGES IN RATES OF WAGES AND HOURS OF LABOUR IN 1899.

THE following particulars relating to the changes recorded by the Board of Trade as having taken place during last year in rates of wages and hours of labour, are taken from the current number of the "Labour Gazette." They are subject to correction in the annual report, which will also include the wage statistics relating to railway servants, seamen, and agricultural labourers. Complete information as regards these three important employments will not be available until the annual returns relating to them have been compiled. It can, however, be stated generally that wages in these trades have shown an upward tendency, in sympathy with the general movement in wages throughout the country, the extent of which will be seen from the following statistics.

The upward movement in wages which commenced—to a small degree—in the latter part of 1895, and continued during the three following years, was fully maintained in 1899; the number of workpeople affected by increases in rates of wages being over 1,100,000—a larger number than in any previous year for which statistics are available; while only just over 1000 were affected by the decreases reported. The total effect of all the changes in 1899 was a net increase of £85,820 per week in total wages, equivalent to an average rise in weekly wages of 1s. 6½d. per individual affected. Of this total, £49,000, or 57 per cent., went to the coal miners, £13,000 (15 per cent.) to the iron and steel workers, and £6400 (7 per cent.) to building trade employees. The engineering and shipbuilding trades show an increase for 1899, but only a small one, both absolutely and relatively. The computed increase in wages last year was £2068 per week, as compared with £15,679, £9751, and £9904 in the three preceding years. The steady rise in wages throughout the four years, however, amounts, it will be seen, to a matter of £37,402 per week; so that the workers have every reason to be satisfied with having maintained and slightly increased their wages in 1899. Of the 1,112,000 workpeople whose rates of wages were changed last year, only 31,000, or 2·8 per cent., were affected by disputes causing a stoppage of work; while the remainder obtained their better rates of pay, half by means of negotiations (either direct or through representatives), one-third through the medium of Conciliation Boards or similar bodies, and one-sixth through the operation of sliding-scales.

The changes in the hours of labour recorded last year were inconsiderable, either in regard to the number of hands affected or the reduction in the weekly hours. Those hours were reduced in the case of some 29,100 workpeople, and increased in the case of 2600; the net result being an average decrease of about half-an-hour per day in the hours of labour of the 31,700 hands in question. Nearly one-third of the total number affected by the changes were workers in the building trades; in the coal-mining industry 3800 workmen had their hours reduced half-an-hour daily (a change scarcely sufficient to materially affect the total output for the kingdom); in the engineering and allied trades 6300 workpeople obtained a reduction of nearly an hour per day (the eight-hour day being adopted in one case involving 710 hands); while 4668 employees of public authorities obtained an average reduction of 9½ hours per week. This high figure is due to the reduction by 12 hours per week of the working time of 1000 tramwaymen in Liverpool, the adoption of the eight-hour day for 570 employees of the West Ham Corporation, and the change from seven to six days' labour per week affecting over 1900 tramway men in the employment of the London County Council. We do not view with too great favour the labour policy of the London County Council and many other public authorities—the workers' vote is given too great a prominence in the consideration of rates of wages and hours of labour; but we are not disposed to cavil at the recorded mitigation of the conditions of service for tramway employees, which are too often nothing less than scandalous.

PERSONAL.

Mr. G. ELLIOTT has obtained the managership of the Ayton (Berwickshire) Gas-Works.

The management of the Lochgilphead Gas Works has been placed in the hands of Mr. J. RENFREW, foreman at the Kelso Gas-Works.

Mr. JOSEPH HEATON was appointed Assistant Gas Manager by the Brighouse Town Council, at their last meeting, in terms of the advertisement that recently appeared in our columns.

The vacancy in the managership of the Herne Bay Gas-Works caused by the death of Mr. H. Legg, has been filled by the appointment of Mr. C. V. BENNETT, formerly of Wells (Somerset), and recently of Felixstowe.

Mr. JOHN DUNCAN, who has been for a long time employed in the Broughty Ferry Corporation Gas-Works, has been appointed Manager of the Kirriemuir Gas Company, in succession to Mr. C. P. Myers, who has obtained the managership at Troon.

The Gas Committee of the Macclesfield Corporation have selected, from 22 candidates for the Gas Engineership, Mr. ERNEST LOMAX NEWBIGGING. The office, it will be remembered, was rendered vacant by the appointment of Mr. J. G. Newbigging as Chief Gas Engineer to the Manchester Corporation. Mr. E. L. Newbigging is the youngest son of Mr. Thomas Newbigging; and he will take up his duties at Macclesfield with the best wishes of his father's numerous friends in the gas industry.

Mr. STEPHEN MOORE, the General Manager of the water undertaking of the Nottingham Corporation, has just been presented with a very handsome silver cake-basket by the Staff of the Water Department, as a mark of esteem on his birthday. The Chief Clerk (Mr. Copley) made the presentation in a complimentary speech; and Mr. Moore, in returning thanks, said no official could be served with a better or more loyal staff. Mr. Moore was formerly in Messrs. Smith's bank; and in 1866 he was appointed Chief Accountant to the Nottingham Water Company. On the transfer of the undertaking to the Corporation in 1880, he became General Manager.

On leaving Droitwich to take up his duties as Manager of the Market Harborough Gas-Works, Mr. A. T. HARRIS was presented by the members of the Corporation and a few friends with a marble clock and a case of drawing instruments, in recognition of his sixteen years' faithful and valuable service. The presentation was made by Alderman Langford, who referred to the admirable manner in which Mr. Harris had performed his duties, and congratulated him on his new appointment. He said that during the time Mr. Harris had been Manager, the make of gas had augmented more than 300 per cent., the price had been reduced 50 per cent., and the public lamps increased 50 per cent., with improved lighting. Mr. Harris thanked the Chairman and all the subscribers for their very handsome gifts, and spoke of the cordial relations which always existed between the Corporation and himself. Mr. Harris, who was Quartermaster-Sergeant of Volunteers, was also presented with a pair of binocular glasses by Major Tombs and the sergeants of the company.

OBITUARY.

The recent death is announced of Mr. H. BOULGER, who had been Manager of the Maryborough Gas Company for about 45 years.

The Directors of the Elland-cum-Greetland Gas Company have lost a colleague in the person of Mr. THOMAS HAWLEY, whose death at the age of 71 took place on the 22nd inst.

We record with deep regret the death of Mr. HERBERT HARRY HICKMOTT, the Town Clerk of Rotherham, at the early age of 41 years. The loss to the borough is inestimable; and the event deserves mention in our columns owing to the conspicuous benefits which Mr. Hickmott's services conferred upon the water undertaking.

The death is announced of Sir GEORGE HENRY LONG, Chairman of the Windsor Gas Company. Deceased was a solicitor by profession, and for some years held the office of Town Clerk, and Clerk to the Windsor Magistrates, the Justices of the Berkshire Petty Sessional Division, and the Buckinghamshire Magistrates at Slough. He had also been Clerk to the Windsor Urban Sanitary Authority. He was Mayor of Windsor in 1897, the Diamond Jubilee year, when he was knighted.

German Protest against the Prohibition of the Exportation of Carbolic Acid from England.—From German chemical papers just to hand, we learn that the Order in Council prohibiting the exportation from the United Kingdom of carbolic acid and certain other coal-tar products, which was referred to in the "JOURNAL" last week (p. 194), is deeply resented by many German chemical manufacturers. It is pointed out that about one-third of the whole of the carbolic acid produced in England ordinarily goes to Ludwigshafen, where it is worked up into various products. The idea that the Ordnance Department requires the whole of the carbolic acid produced in the United Kingdom for the manufacture of picric acid is scouted as absurd by the German technical papers. The chemical manufacturers affected by the promulgation of the Order are said to have lodged a protest with the Chancellor of the German Empire.

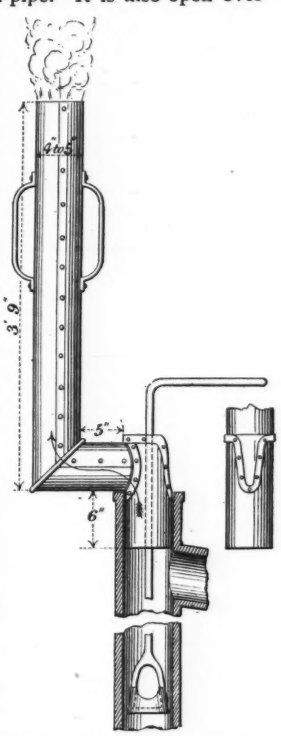
COMMUNICATED ARTICLES.

A SMOKE-PREVENTER FOR PIPE-JUMPERS.

By J. O. V. IRMINGER, of Copenhagen.

Every gas engineer, and especially every pipe-jumper, knows what a difficult and troublesome work it is to clean the ascension-pipes, owing to the intense smoke that injures the chest and lungs, and makes the work very disagreeable. I have now made an apparatus that facilitates this work, and as it has proved to be excellent, and has been received with unusual satisfaction, I want to describe it, so that it may be used in other gas-works. I am sure that when the pipe-jumpers have used it once, they will always use it.

The apparatus (as shown) is very simple and easily applied. It consists of a bent iron tube, open at both ends, and is put down the mouth of the ascension-pipe. It is also open over the ascension-pipe, so that the tools for cleaning the pipes may be used as usual. If it is wanted to use the rod without making it longer than is just necessary, there is a small cutting in one side of the tube. When the tube is placed in the ascension-pipe, the smoke immediately goes up through it, and the pipe-jumper is completely free from smoke during the whole work. When, at the commencement, the tube is cold, and will not act immediately, the only thing necessary is to cover the opening over the ascension-pipe for a moment. The smoke will then go the right way; and this will also continue when the tube is shifted to another ascension-pipe. The retort-lid must be shut during the work; otherwise the tube will not act.



The tube is made of thin riveted plates (No. 24 B.W.G.); and the weight is about 9 to 10 lbs. It is thus very easily managed. The diameter of the tube that is put into the ascension-pipe is ¼ inch less than the inside diameter of the ascension-pipe. On the tube are fixed two light handles.

Pipe-cleaning is such hard work, that everything that can make it easier will be for the benefit both of employers and workmen; and this tube affords a simple and secure relief. Some might think that the opening just over the ascension-pipe would prevent the smoke from going the right way; but, in effect, it acts thoroughly.

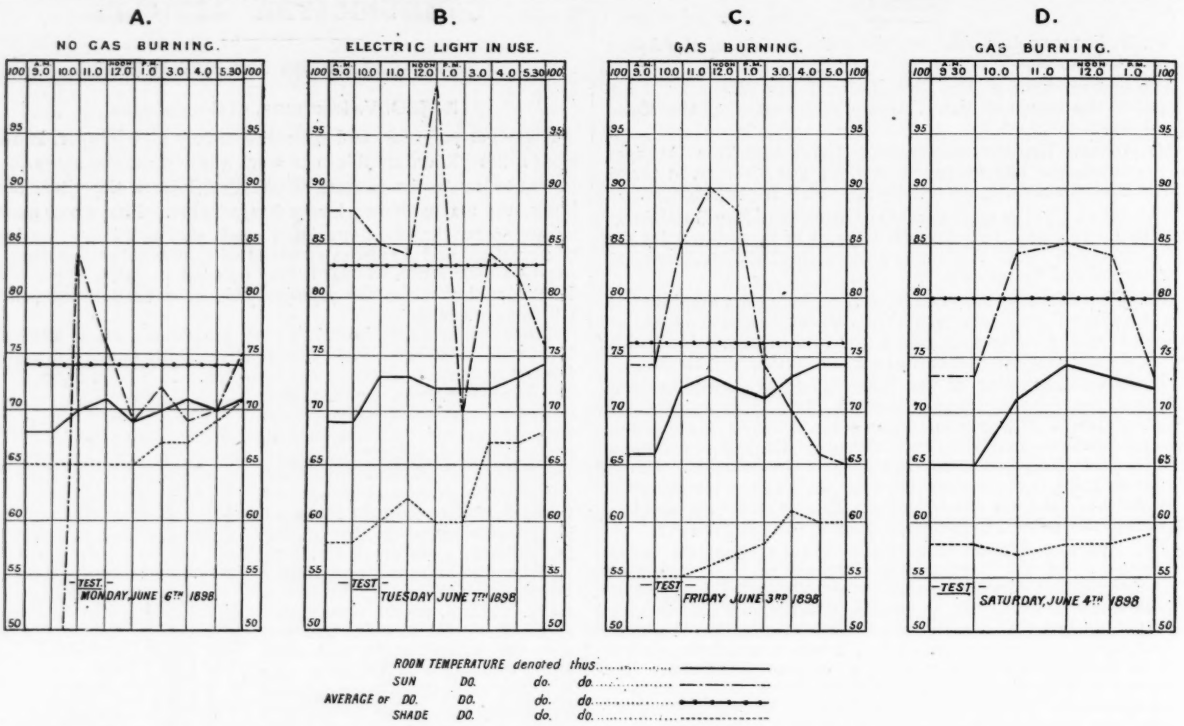
I should be very glad if the apparatus were tried at one or more foreign gas-works, and hope to see the results of the trials published in the "JOURNAL," so that other colleagues may take advantage thereof.

THE TEMPERATURE OF GAS AND ELECTRIC LIGHT.

By CHARLES F. BOTLEY, Assoc.M.Inst.C.E.,
Gas and Electrical Engineer, of Hastings.

With reference to a "Note," in the issue of the "JOURNAL" for the 16th inst., respecting the temperatures of various gas and electrical lamps, it has occurred to me that some experiments I made a short time since in regard to the heating effect of gas on the atmosphere of a room might be of interest to your readers. The tests were made under the ordinary conditions of use in our room, which is lighted by eleven electric glow lamps and ten "C" incandescent gas-burners; and I send herewith a diagram (p. 264) showing the results obtained, which may serve to induce others to make investigations on a similar line, since the question involved is an important one, and is made much use of by electrical canvassers.

The room was the one in which the members of the Institution of Gas Engineers had their luncheon on the occasion of their visit in 1896, and tests were made under ordinary conditions with the door and windows closed—indeed, in one of the experiments with the gas alight, my assistant went so far as to stop up the two fireplaces until I discovered it; so that we did not favour the gas. The candle power of the gas used was 500; and of the electric lamps, 224. The content of the room was 16,000 cubic feet. The temperature is given in degrees Fahrenheit; and it was taken at a height of 6 ft. 6 in. from the floor. The other data necessary to follow the experiments are given on the diagram; and I would suggest the importance of noticing the characteristics of the experiment when neither gas



nor electricity was in use. It will be observed that the atmospheric temperatures materially affect the question.

In the case of gas lighting and the heat produced, with distinct reference to modern practice, it has always appeared to me a case of "giving a dog a bad name;" and I have often noticed that the heat complained of as having arisen from the use of gas in a building has been due either to the number of people present or to atmospheric conditions, although it is next to impossible to make the ordinary public understand this. As, however, in the case of lighting a church, I had guaranteed that, with incandescent burners, the temperature and condition of the air should be as satisfactory as if electricity were used, I was induced to make the experiments in question to satisfy myself. I should like it to be clearly understood that the results are not regarded by me as conclusive; and I shall take the opportunity of repeating them as soon as I can.

"GAS FOUNTAINS."

By JUST ALIX, Chemist to the Lyons Gas Company.

Among the numerous satellites of the gas industry, there are several which have for some time become exceedingly interesting; for example, petroleum, now employed as an agent for producing incandescence, and acetylene, which is making good progress. Besides these, however, there are others which have not, up to now, been very successful, owing principally to the restrictions attending their practical application. I am referring to the various processes by which it has been sought to utilize the high photogenic properties of certain hydrocarbons to enrich gases having no light-giving power, one of the most attractive of which is air. The enrichment of air by illuminating hydrocarbons—the air acting as a carrier of the lighter gases—is, of course, not a new idea. Nearly seventy years ago, Mongruel, in Paris, brought out a process for carburetting air by means of light oils; and in 1847, Mansfield had a patent for using light hydrocarbons for a similar purpose.

The most recent process of this kind is that employed in connection with the so-called "gas fountains." A precursor of these appliances, however, was that of Mille, who invented a process which caused some stir about the year 1866. His lamp, which he called the "gazo-lamp," was so constructed that, "without any mechanism, it could furnish a supply of atmospheric air in the state of inflammable gas perfectly suited for heating and lighting." It was fed by "essences or ethers of petroleum." In the accompanying illustration, fig. 1, one will recognize the principle of the appliance patented last year by a Company whose headquarters are at Fontaines-sur-Saône, near Lyons. The "gazo-lamp" of Mille consists of a rectangular vessel A B, containing a basket $A^1 B^1$ of wire gauze filled with some absorbent material, such as coke, pumice stone, or sponge, capable of holding petroleum essence, but not in excess. Air entering by the opening O is charged with hydrocarbon vapours which make it heavier; it then descends, and issues from the pipe O^1 ready for consumption. It burns with a very brilliant and remarkably steady flame. Here, in embryo, is the "gas fountain" which is at present being exploited by the Company above referred to. The inventors have therefore gone a little too far in making out that their gas is produced upon "an entirely new principle." However, their appliances are very portable; and were it not for the price, the popularization of the gas should be encouraged.

The "fountain" is composed of a tin vessel, resembling in size and shape an ordinary domestic petroleum oil-can. At the upper part there are two tubes (see fig. 2), one of which dips to the bottom of the vessel, which is filled with a light permeable substance (the inventors prefer paper pulp) having great absorbing power for light hydrocarbons. This pulp is moulded into the form of small prisms placed one over the other in baffle-plate fashion, so that the air can circulate freely between them. The apparatus is charged with petroleum either, boiling at 122° to 158° Fahr., and of ·650 to ·720 specific gravity. Formerly these essences were but little employed. They are, in fact, so light that they had to be excluded from the category of lamp oils because their vapours caused explosions in petroleum lamps.

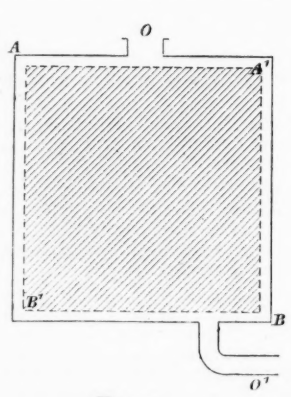


FIG. 1.

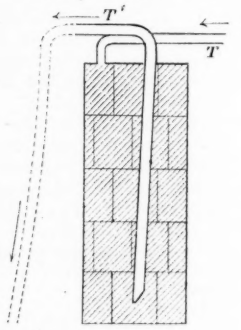


FIG. 2.

But now their price has gone up, in consequence of the great demand for them for use with petroleum motor cars. When the apparatus has been charged, it is absolutely harmless. A lighted match may be brought near it without causing an explosion, inasmuch as there is no current of gas. In order to produce one, there is attached to the tube which dips to the bottom of the vessel a second, and longer tube, which acts as a syphon. The air, as it becomes carburetted, increases in density, and descends into the outlet-pipe T^1, at the same time causing an inflow of air by the pipe T. This operation is continuous. It will be readily understood that under such conditions—the difference in the specific gravities of the carburetted and non-carburetted air being but slight—only a very low pressure is obtainable at the points of consumption, even though they may be located at a certain height. It is this that necessitates the employment of special burners with this aërogene gas. These have been devised by the inventors, and one was described in the "JOURNAL" for Dec. 26, 1899 (p. 1553).

An obstacle which presented itself when the carburetting process was first used with the "gazo-lamp" was the necessity for having special service-pipes. In fact, as the gas has very little pressure beyond that which it acquires in its descent to the burner, it is necessary to carefully avoid everything likely to reduce it, such as elbows, contractions, friction, &c. It is for this reason that large service-pipes have to be employed. When from one to ten burners are used, the diameters of the pipes vary as follows:—

No. of Burners.	Diameter. Inch.	No. of Burners.	Diameter. Inch.
1	7-25ths	6	18-25ths
2	10-25ths	7	20-25ths
3	13-25ths	8	22-25ths
4	15-25ths	9	23-25ths
5	17-25ths	10	24-25ths

These diameters require increasing slightly in practice in order to compensate for the action of elbows and sharp angles.

With regard to coupling up the "fountains," two arrangements may be adopted: (1) To have installations of series of three burners, and adapt to each distributing system a "fountain" of corresponding section. (2) To have one distributing system to as many multiples of three burners as there are jets to supply. The vessels are then put in communication with each other. The second method is the best for ensuring the complete emptying of the "fountains."

I have personally visited the show-room of the Company in Lyons, in which the gas produced by these "fountains" is to be seen in use. The vessels are placed upon a shelf near the ceiling, at a height of 10 to 12 feet above the point of consumption. Under these conditions, the gas burns well, particularly in a Bengel burner specially adapted for the purpose. I remarked, however, that the flame had that slightly reddish appearance which to gas engineers is an indication of the presence of air during the combustion of hydrocarbons. At the time of my visit, the inventors were trying a new burner fitted with a Welsbach mantle; but I doubt if the results were satisfactory. It seems to me difficult to make the gas burn in the presence of an additional quantity of air, which, in view of the low pressure of the gas, would only decrease the rate of delivery, and, moreover, have a serious cooling effect. As the air contained in the gas serves only as a carrier, it will be readily understood that the combustion temperature of the hydrocarbons should be for the most part absorbed in heating it. This, as a matter of fact, really occurs with coal gas when an inert gas such as nitrogen is put into it. However, the inventors utilize their gas for heating and culinary purposes, in stoves specially constructed. They have also at work an engine operated by it. It drives a small dynamo supplying current to some incandescent electric lamps. But this utilization of the gas does not appear to have before it a very great future, as the "fountain" in this case plays the part of the air carburetter in auto-motors; and, under these conditions, I question whether this transformation of energy would be attended with benefit. Information is wanting as to the results obtained by these motors.

In conclusion, I may say that each "fountain" contains about a gallon of gasoline; and the inventors claim for their gas that, by supplying it to a 15 decimal candle burner, 70 hours' lighting can be obtained at the cost of rather less than ½d. per burner per hour.

Protected Lead Pipes.—At Seeforts, near Copenhagen, there is a water conduit, about 1200 yards in length, running through the sea. The diameter of the lead pipe is 2 inches; and it is protected by a coil of steel wire, over which is a jacket of jute. It was laid in the manner followed in putting down submarine cables.

Rapid Methods for the Purification of Waters.—In a recent number of the "Journal de Pharmacie et de Chimie" there is a paper by M. Malmejac upon the above subject. It deals, however, rather with mechanical than with chemical action in the purification of water. The author has experimented on four processes, two using alum, and two using perchloride of iron. The experiments show that the perchloride of iron processes give the best results, as they diminish the proportion of organic matter, either in an acid or alkaline medium, by 60 per cent.; while the alum processes only reduce it by 25 and 33 per cent. respectively. The two latter, however, have a stronger action—nearly three times as powerful—in destroying microbes.

Artificial Stone.—An artificial stone made in Belgium has been tested in the Malines Arsenal. It is said to have four times the resisting force of French freestone, is not sensitive to the action of cold, absorbs only 6 to 7 per cent. of water, even after a long dry spell, and cannot be crushed under a pressure of 40 kilos. to the square centimetre. The stone is manufactured in the following manner: Eighty parts of extremely clean and dry coarse sand are mixed with 20 parts of hydraulic lime reduced to a fine dry dust. The mixture is put into an iron box, which is plunged into a boiler of water, which is hermetically closed. During 72 hours the cooking goes on under a pressure of six atmospheres; the temperature being maintained at 165°. At the end of this time the iron box contains a perfect homogeneous mass of stone, which rapidly hardens upon exposure to the air.

TECHNICAL RECORD.

THE ILLUMINATING POWER AND COLOUR OF THE "KUGEL" HIGH-PRESSURE GASLIGHT.

Dr. H. Bunte and Dr. P. Eitner, of Carlsruhe, have recently published in the "Journal für Gasbeleuchtung" an account of an exhaustive investigation of the illuminating power and colour of one form of intensified gaslight. The work was undertaken at the desire of the "Kugel" Light Company, of Dresden, with the so-called "Kugel" or "Ball" light, invented by Herr Salzenberg, Manager of the Crefeld Gas-Works. This light is essentially a high-pressure gaslight, in which gas pressures of 1 atmosphere and upwards can be employed and specially good results secured. The report of the investigation is of general interest, as such researches hitherto have been of a disjointed character. The work was directed chiefly to the following points: (1) Ascertaining the illuminating power at various gas pressures, the rate of consumption, the composition of the gas, and of the mixture of gas and air in the burners. (2) Determining the illuminating power at different angles. (3) Comparing spectrophotometrically the Kugel light, high-pressure gaslight, ordinary incandescent gaslight, and the Hefner light.

The determination of illuminating power was made by direct comparison of the light of a Kugel burner with the light of a standardized Hefner amyl-acetate lamp, consuming amyl acetate of standard quality. A Kruss's Lummer-Brodhun sighting-box, the equality of the two sides of which had been proved, was used for making the comparisons; and the Hefner lamp was placed at a distance of 300 mm. (nearly 12 inches). The distance of the Kugel light was afterwards measured, and its illuminating power calculated therefrom. The pressure of the gas was ascertained by means of a mercury pressure-gauge, which was directly connected just below the nozzle of the burner. The Kugel burner had a double mantle made by Messrs. Feuer, of Berlin. Five observations were taken in each case; and each figure recorded below is the mean of the five results.

In order to determine the rate of consumption, the top of the burner and the mantle were removed; and the air-inlet holes of the bunsen were closed with putty, so that they were gas-tight. The top of the bunsen tube was then connected with the inlet of an experimental gas-meter; and the gas issuing from the outlet of the meter was led off into the open. The meter, &c., threw a back-pressure of at the most some 4 inches of water; and this would about compensate for the resistance ordinarily offered by the burner-top and the mantle. Two observations of the rate of consumption were made in each case; and the meter was verified before and after each observation. Each figure stated below is the mean of the two results.

The figures given in the original table have been converted into English terms on the assumption that 1 Hefner-unit equals 0·877 English sperm candle. The results of the observations then become as follows:—

Pressure of the Gas. Atmospheres.	Illuminating Power. English Candles.	Rate of Consumption. Cub. Ft. per Hour.	Efficiency. Candles per Cub.
0·2	290·7	15·70	18·5
0·4	465·9	24·01	19·4
0·6	649·2	29·67	21·9
0·8	818·3	34·80	23·5
1·0	904·5	39·20	23·1
1·1	1033·0	41·32	25·0
1·2	1080·1	43·53	24·8
1·4	1140·5	47·59	24·0

At the normal working pressure of 1·1 atmospheres, the Kugel light therefore gives an illuminating power of 1033 candles, which is higher than that hitherto afforded by single incandescent gaslights, and at the present time can be attained practically only by means of the electric arc lamp. The value 904·5 candles found for 1 atmosphere pressure, clearly was lower than it should be, though no reason could be given to account for the discrepancy. The efficiency is highest at a gas pressure of 1·1 atmospheres, and is then very high. For instance, good new [German] Welsbach burners show an efficiency of about 17 candles per cubic foot; while the Pintsch high-pressure gas-burner, working at 0·2 atmosphere pressure, yields about 220-candle power for a consumption of 9·36 cubic feet per hour, which indicates an efficiency of about 23·4 candles per cubic foot of gas. The results of the examination showed that the Kugel burner afforded a very economical utilization of the gas, with the production of a light of great intensity and of a yellowish tint.

For the sake of completeness, the composition of the gas used was determined; and the following shows the percentage by volume of the several constituents: Carbonic acid 2·2, heavy hydrocarbons 3·4, carbonic oxide 7·7, methane 32·3, hydrogen 52, and nitrogen (with traces of oxygen) 2·4. The gas under high pressure had the same composition, but constantly contained some air. Even after repeated exhaustion and refilling of the compressing cylinder, about 4·5 per cent. of air was discovered in the high-pressure gas. In order to find the composition of the mixture of gas and air in the burners, they were set up but not lighted; and samples of the gaseous mixture were withdrawn from the interior of the mantle by means of a capillary

tube, and subjected to analysis. The following percentages by volume of gas and air were found under the stated conditions:—

—	Kugel Burner.		Pintsch's High-Pressure Gas-Burner.	Welsbach Burner.
Pressure of gas.	0·2 atmosphere	1·1 atmosphere	0·2 atmosphere.	14-10th of water.
Gas	22·87	13·88	13·54	22·5
Air	77·13	86·12	86·46	77·5

The distribution of the light was observed by means of Kruss's radial photometer. For the sake of comparison, some observations were also made, with an Elster radial photometer, on the distribution of the light from the Welsbach burner. The results are shown in the appended table, in which 0° signifies vertically beneath the burner, 90° the horizontal plane, and 180° vertically above the burner. As the figures were required only for comparison with one another, the absorption factor of the mirror of the radial photometer was not ascertained.

Angle, degrees.	10	20	30	40	50	60	70	80
Illuminating power, English Candles—								
Kugel	66·9	126·3	185·2	251·4	294·8	316·6	358·0	356·7
Welsbach	..	8·5	15·8	23·3	30·3	36·0	..	..

Angle, degrees.	90	100	110	120	130	140	150	160
Illuminating power, English Candles—								
Kugel	388·0	386·7	363·8	333·5	306·7	257·5	215·3	158·3
Welsbach	46·5	..	..	..	..	..	..	..

These figures indicate, as may readily be seen diagramatically, that the Kugel burner affords a more uniform distribution of light than does the Welsbach burner. The reason for this difference may be traced in the longer mantle of the Kugel light, and the globular shape which it assumes on use, especially in its upper half. The radiation thus occurs from a globular surface. The bulging of the mantle is not due to the asbestos fibres by which it is supported, nor does it return to its original form when the pressure is discontinued.

With regard to the colour of the Kugel light, it has been noticed at the Crefeld Gas-Works—where it is used side by side with the ordinary Welsbach light—that it has an agreeably warm yellowish tint, while the latter is of the well-known peculiar greenish colour. The impression is not the result of an optical illusion due to the great difference in the intensities of the two lights, for the same variation in tint is observed when the lights are compared on the photometer and the disc is equally illuminated by them. The difference in this case resembles that which occurs when the Welsbach light is compared with the light of the Hefner lamp. The ordinary high-pressure (0·2 atmosphere) gaslight resembles the Welsbach light in colour; and it therefore becomes pertinent to ask if the special colour of the "Kugel" light is to be traced to the high gas pressure of 1·1 atmospheres. This question was first attacked by making spectrophotometric observations of the Kugel light, the high-pressure gaslight, and the Welsbach light, with mantles prepared in precisely the same manner and of the same composition, and using different gas pressures.

The high-pressure gaslight, with 0·2 atmosphere pressure of gas, was obtained by means of an incandescent burner the orifices of the nipple of which had been reduced in size, until, at the pressure named, the burner consumed about 7 cubic feet of gas per hour, and was adapted for the use of a simple mantle. In the tests, the actual rate of consumption was 7·14 cubic feet per hour. In order to obtain mantles of identical quality, the unprepared fabrics were impregnated carefully with a 30 per cent. solution of the nitrates of thorium and cerium, in such proportions as would (on incineration) yield a mantle consisting of 98·75 per cent. of thorium oxide and 1·25 per cent. of cerium oxide. A special spectrophotometer was devised for the work, in order that the intensity of the similar rays from different sources might be directly compared. The light of the source under investigation was broken up by a prism into its components, in such a manner that two coloured bands—one above the other—were obtained. The one band was the light of the standard lamp, the other the light of the source under comparison. Similar colours were precisely above one another. By means of an eye-slit, any portion of the spectrum could be examined, apart from the rest, at will. The position of the portion of the spectrum under examination could be determined by means of a scale. The measurements were made in each case in the red, yellow, green, blue, and violet portions; and the range over which they extended comprised the six divisions of Bunsen's spectroscope scale. The comparisons were made at first with a standardized Hefner lamp, burning amyl acetate which had on testing been found to be of normal quality. The pressure of the gas was observed on a mercury pressure-gauge. The results given in the subjoined table show the intensity of the source of light in each colour, when the intensity of the Hefner light in the same colour was taken as unity. Each figure given is the mean of two observations; and the sighting-box was reversed between the two readings.

Colour of the Light.	Position according to Bunsen's Spectroscope Scale.	Mean Wave Length of the Light.	Intensity (Hefner Lamp = 1). Welsbach Light, 2 inches of Water Pressure.	High-Pressure Gas, 0·2 Atmos. Pressure.	Kugel Light, with Double Mantle, at 1·1 Atmos. Pressure.	Kugel Light, with Double Mantle, at 0·2 Atmos. Pressure.	Kugel Light, with Simple Mantle, at 0·2 Atmos. Pressure.	Kugel Light, with Simple Mantle, at 1·1 Atmos. Pressure.
Red . .	32·0	670 $\mu\mu$	31·1	160·4	421·2	183·9	308·3	120·6
Yellow .	50·0	589 ,,	44·9	252·9	578·2	256·3	431·5	183·5
Green . .	65·5	540 ,,	59·5	319·7	710·5	304·3	544·0	229·1
Blue . .	95·5	477 ,,	73·9	484·3	986·6	376·8	823·6	321·5
Violet . .	126·0	434 ,,	64·1	529·0	1053·6	444·5	945·6	341·2

At the high gas pressure of 1·1 atmospheres, efficiency is lost when the simple mantle is used, as the flame passes completely through it; hence the figures are much lower than when the double mantle is used. The table indicates clearly that, with all the lights examined, the intensity, relative to that of the Hefner light, rises from the red to the blue end of the spectrum. The purport of these figures will be seen more clearly from the following table, which is deduced from the preceding one, and expresses the intensity for each source of light in terms of the intensity of the same source in the red. The Hefner light remains the unit of comparison in all colours.

Colour of the Light.	Position according to Bunsen's Scale.	Intensity, compared with that of the Hefner Light. Welsbach Light; 2 Inches of Water Pressure.	High Pressure Gas; 0·2 Atmos. Pressure.	Kugel Light. Double Mantle. 1·1 Atmos. Pressure.	Double Mantle. 0·2 Atmos. Pressure.	Simple Mantle. 0·2 Atmos. Pressure	Simple Mantle. 1·1 Atmos. Pressure.
Red . . .	32·0	1·000	1·000	1·000	1·000	1·000	1·000
Yellow . .	50·0	1·144	1·571	1·373	1·394	1·400	1·522
Green . .	65·5	1·913	1·993	1·687	1·655	1·765	1·900
Blue . . .	95·5	2·376	3·019	2·342	2·049	2·672	2·656
Violet . .	126·0	2·061	3·298	2·501	2·417	3·067	2·829

There is a remarkable concordance between all these figures, with the single exception of those for the ordinary Welsbach light, which show a decreased intensity in the violet. The comparison indicates that the high-pressure gaslight should appear bluish, the Welsbach light greenish, and the Kugel light with the double mantle reddish in tone. The Kugel light with simple mantle closely resembles the high-pressure gaslight. The difference towards the blue and violet is not, however, so great as it seems; for the Hefner light, which forms the basis of comparison, is very poor in blue and violet rays. In order to gain a proper impression of the relative colour of the high-pressure gaslight, the Kugel light, and the Welsbach light, the first two were compared spectrophotometrically with the last. In addition, from the figures already obtained in the comparisons with the Hefner lamp, the intensity of the first two in the different colours was calculated in terms of the intensity of the Welsbach light, regarded as unity for all colours. In the direct comparisons, six observations were made; and the means are—

Colour of the Light.	Position according to Bunsen's Scale.	Intensity (the Intensity of the Welsbach Light = 1). By Calculation from the Hefner Light Results. Kugel Light. Double Mantle. Pressures 0·2 Atmos.	1·1 Atmos.	Simple Mantle. 0·2 Atmos.	1·1 Atmos.	High-Pressure Gaslight. 0·2 Atmos.	By Direct Observation. 0·2 Atmos	Kugel Light, Double Mantle. 1·1 Atmos.
Red . .	32·0	5·913	13·543	9·913	3·878	5·158	3·751	17·832
Yellow .	50·0	5·703	12·866	9·602	4·083	5·628	3·803	15·414
Green .	65·5	5·114	11·941	9·143	3·851	5·373	3·853	17·043
Blue .	95·5	5·099	13·351	11·145	4·351	6·553	4·179	18·533
Violet .	126·0	6·934	16·437	14·752	5·323	8·253	5·013	20·753

Here, however, as in the case of the Hefner lamp comparisons, the true relation between the colours is not readily seen until only such an amount of light is contemplated as gives equal intensity in one colour. If, therefore, the intensity of colour of the lights compared with the Welsbach light is expressed in terms of the intensity in the red, which is taken as unity, the following values are obtained :—

Colour of the Light.	Position According to Bunsen's Scale.	Intensity, Compared with that of the Welsbach Light.						
		By Calculation from the Hefner Light Results.					By Direct Observation.	
		Kugel Light.				High Pressure Gaslight.		Kugel Light, Double Mantle.
		Double Mantle.		Simple Mantle.				
		Pressures 0·2 Atm	1·1 Atm.	0·2 Atm	1·1 Atm.	0·2 Atm.	0·2 Atm.	1·1 Atm.
Red .	32·0	1·000	1·000	1·000	1·000	1·000	1·000	1·000
Yellow .	50·0	0·965	0·950	0·969	1·053	1·091	1·014	0·862
Green .	65·5	0·865	0·882	0·922	0·993	1·042	1·027	0·953
Blue .	95·5	0·862	0·986	1·124	1·122	1·271	1·114	1·036
Violet .	126·0	1·173	1·214	1·488	1·373	1·600	1·336	1·161

These figures show a remarkable concordance. It is, however, again apparent that the Kugel light with a simple mantle closely resembles the high-pressure gaslight, and that they are both distinguished from the Kugel light with double mantle by the blueness of their tone.

The Kugel light was next compared spectrophotometrically with the high-pressure gaslight. Six observations were made in each case; and the mean results are recorded in the first of the two cross-page tables at foot, in which also values deduced from the preceding comparisons with the Hefner lamp and the Welsbach light are included. If, again, the quantity of light in the red in each case is taken as 1, the relations between the colours are shown more clearly, as in the second cross-page table. Finally, by deducing the mean values from the results of the different observations, the summary appended, showing the relations between the colour intensities of the lights, is obtained. The Kugel light is here taken only when working with a double mantle, and at its normal pressure of 1·1 atmospheres. The final figures of the summary show clearly that the high-pressure gaslight is bluish, and the Kugel light reddish, in tone compared with the Welsbach light; while the Kugel light also is reddish in comparison with the high-pressure gaslight. The investigation, however, has shown that the reddish colour of the Kugel light does not arise simply from the high gas pressure of 1·1 atmospheres which is employed. The figures show that the Kugel light with the double mantle, working at 0·2 atmosphere pressure, is even redder than when the same mantle is used at

Colour of the Light.	Position according to Bunsen's Scale.	Comparison with the Welsbach Light.		Comparison with the High-Pressure Gaslight.
		High-Pressure Gaslight.	Kugel Light.	Kugel Light.
Red . .	32·0	1·000	1·000	1·000
Yellow .	50·0	1·053	0·906	0·881
Green. .	65·5	1·035	0·918	0·901
Blue . .	95·5	1·193	1·011	0·874
Violet . .	126·0	1·468	1·188	0·829

the higher pressure of 1·1 atmospheres; while, on the other hand, the Kugel light with the simple mantle is, either at 1·1 or 0·2 atmosphere pressure, very similar in tone to the high-pressure gaslight. The reddish colour of the Kugel light, therefore, arises chiefly from the mantle used. In the first place, the mantle is double; in the second place, it is of compact structure. The weight of the incinerated Kugel mantle is 3·838 grammes, which is about seven times the weight of an ordinary mantle. But though the reddish tone of the Kugel light cannot be directly ascribed to the high gas pressure of 1 to 1·1 atmospheres, yet it actually depends indirectly on the pressure. The mantle, in order that it may be durable under this high pressure, must be of so compact a structure that it necessarily radiates yellowish or reddish light. Such a mantle would be no novelty applied to the ordinary high-pressure gaslights and incandescent burners; and with it they would similarly yield a reddish light. But the use of this mantle at a low pressure would be highly irrational, for a far lower illuminating power would be obtained than with the ordinary mantle giving a greenish light. For instance, a simple Kugel light mantle, used on a high-pressure gas-burner at 0·2 atmosphere pressure, afforded a duty of only 10·05 candles per cubic foot of gas consumed; whereas the same mantle employed at 1·1 atmospheres pressure, as in the Kugel light, showed a duty of 25 candles per cubic foot.

The results of the investigations described in the foregoing report may be summed up as follows :—

(1.)—The application of 1 to 1·1 atmospheres gas pressure enables a very high duty to be economically obtained from the gas.

(2.)—The aforesaid high gas pressure gives a rather more uniform distribution of the light than is obtained with the Welsbach light. This difference is due to the high pressure and velocity of the effluent gas causing the greatest intensity of the flame to be transferred to a higher position, and to the bulging of the mantle which is effected thereby.

(3.)—The aforesaid high gas pressure makes it possible to obtain an agreeable yellowish light concurrently with a very high illuminating duty from the gas consumed.

Colour of the Light.	Position According to Bunsen's Scale.	Intensity (the Intensity of the High-Pressure Gaslight = 1).					
		By Direct Observation.	By Calculation from the Welsbach Light Comparisons.	By Calculation from the Hefner Lamp Comparisons.			
		Kugel Light, Double Mantle.				Kugel Light, Simple Mantle.	
		Pressures 1·1 Atm.	1·1 Atm.	0·2 Atm.	1·1 Atm.	0·2 Atm.	1·1 Atm.
Red	32·0	3·374	4·767	1·147	2·626	1·992	0·752
Yellow	50·0	3·106	4·053	1·013	2·286	1·706	0·726
Green	65·5	3·133	4·423	0·952	2·222	1·702	0·717
Blue	95·5	3·093	4·436	0·778	2·037	1·701	0·664
Violet	126·0	2·905	4·140	0·849	1·992	1·788	0·645

Colour of the Light.	Position According to Bunsen's Scale.	Intensity Compared with that of the High-Pressure Gaslight.					
		By Direct Observation.	By Calculation from the Welsbach Light Comparisons.	By Calculation from the Hefner Lamp Comparisons.			
		Kugel Light, Double Mantle.				Kugel Light, Simple Mantle.	
		Pressures 1·1 Atm.	1·1 Atm.	0·2 Atm.	1·1 Atm.	0·2 Atm.	1·1 Atm.
Red.	32·0	1·000	1·000	1·000	1·000	1·000	1·000
Yellow.	50·0	0·921	0·850	0·884	0·871	0·888	0·965
Green	65·5	0·929	0·928	0·830	0·846	0·885	0·953
Blue	95·5	0·917	0·930	0·679	0·776	0·885	0·883
Violet	126·0	0·861	0·869	0·733	0·758	0·930	0·858

VENTILATION WITHOUT DRAUGHTS.

The Ventilation of Gas-Lighted Rooms.

At a recent Meeting of the Society of Arts, a paper on the above subject was read by Mr. Arthur Rigg. In the course of it, he remarked that, as usually practiced, ventilation bears a far closer relationship to art than it does to science; for though many exhausters serve as ornamental finials to a roof, they produce draughts and other evils worse than those they are intended to cure. Ventilation, contemplated as a science, will include warming or cooling an ample supply of air, and the washing, diluting, or removal of deleterious ingredients contained in air which has been breathed. The ventilation of the Houses of Parliament has been a perennial cause of criticism; and, although Committees have reported, and celebrated names have been invoked, yet it remains to the present day a subject of controversy. The new Law Courts serve as a fine example of imperfect ventilation. It was originally supposed that cold air would be so accommodating as to enter only from below, while warm and supposed vitiated air would be equally complaisant and go out only by openings in the ceiling. But the air persisted in following its own natural laws, and not the architect's expectations.

The movements of large volumes of air for purposes of summer or winter ventilation may be carried out generally in three different ways: (1) By vacuum (drawing air out of a room). (2) By plenum (forcing air into a room). (3) By a combined plenum and vacuum system. Furthermore, admission of fresh air may take place—(*a*) At the floor of a room. (*b*) At or near the top of a room. (*c*) At intermediate levels. Where special exits for foul air are provided, these may be situated at the top of a room for ascending currents, or at the floor of a room for the descending current system of ventilation.

The vacuum is the commonest system of ventilation, but when applied to large halls it requires a powerful suction ventilator, generally fixed in the top of a room; and usually no provision whatever is made for an adequate supply of fresh air. Consequently cold air is sucked underneath doors, flooding the floor with a layer of low temperature. In ordinary dwelling-rooms, the fire acts like the ventilator in drawing air out of dwelling-rooms. As a rule, the first draught of importance is that under the doorway, while leaky windows contribute their quota; and an altogether surprising amount of air is drawn through the solid walls. In an ordinary living-room, with a fireplace, an almost ideally perfect system of ventilation can be carried out by admitting fresh air in divided streams into the upper parts of such rooms, where it may mix with the warmer strata it finds there, and gradually descend and pass away eventually up the chimney.

As regards Tobin tubes, the author stated that those fixed at the Royal Institution are of the most modern design and proportions. Their vertical flat inlet-tubes measure 12 in. by 3 in. The total height above the floor is 5 ft. 3 in. The outlet is 20 inches wide at the back, and 18 inches at the front, with a 7-inch wide opening at the top, provided with a thin wire netting as cover. The sectional area for the inlet is 36 square inches; and the sectional area for the outlet, 133 square inches. When a tube of this character is applied to a room filled with warm air, there would not be a sufficiently high velocity to cause it to rise among a volume of air possessing greater heat and less specific gravity. Consequently, cold douches would fall upon the heads of those who happened to be sitting underneath, or near to the inlet of fresh and cold air. The author said the intention in this apparatus seemed to be to destroy most of the velocity which the current would otherwise possess on entering the room; and it was not easy to see why such an object should have been put forward by the designer, unless, perhaps, it was from a desire to counteract some of the tendency of the ventilating arrangements in the roof to absorb all the cold air coming from the Tobin tube before it could serve the intended purpose.

Having described the ventilating arrangements at the Society of Arts, Mr. Rigg proceeded to consider other systems. By the plenum system pure and simple, fresh air is forced into the room at any convenient locality, so no stagnant places need occur; and foul air finds its way out by open doors, windows, or leakages—in fact, through the very openings which advocates of the vacuum system rely on for providing their supply of fresh air! The plenum system is independent of winds and weather, and, indeed, each system is essentially the opposite of the other. By the combined operation of the plenum and vacuum systems, considerable volumes of fresh air can be forced into a room, and a corresponding quantity can be extracted by a ventilator situated generally on the roof. But by whatever method a supply of fresh air enters a room, there are two grand divisions in which its disposal can be arranged: (1) As a general up-flow, from floor to ceiling or roof, and out at the top. (2) As a general down-flow, from floor to ceiling or roof to floor, and out at the floor.

In regard to the ventilation of buildings, the author remarked that it is too often assumed that there is no happy medium between that of breathing air utterly foul and a system so profoundly scientific that by no chance shall any part of the air that has been once breathed enter the lungs of another. The common-sense system mixes fresh air with that which has been breathed, or may be breathed again, and it does this without draughts or appreciable inconvenience; while the over-scientific system sends large volumes of cold or heated devitalized air into a room, and expects the forceful, irregular currents to travel in all sorts of ingenious ways that no independent currents would ever be likely to follow under any natural impulse.

The author next described a system of ventilation of which he highly approved. A suite of rooms, erected in 1898 in London, has been provided with a system of natural ventilation which he considered as nearly as possible perfection, subject, however, to the one defect of being interfered with by contrary winds. This building runs almost due north and south, and advantage has been taken of the prevailing winds (which are south-west and north-east) to apply the inlet arrangements to both sides of the building, so that one or other can be relied upon. The suite of rooms consists of—

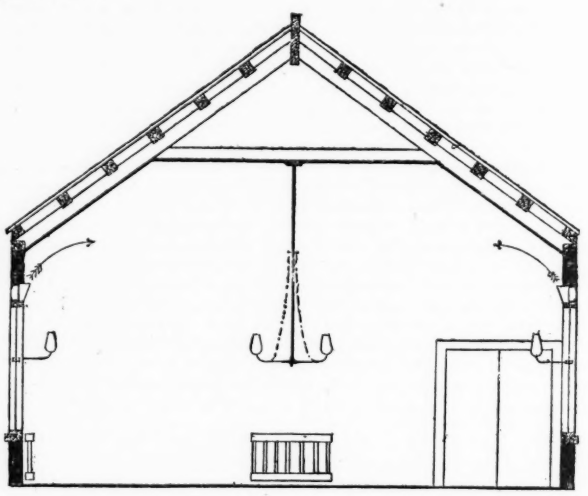
Entrance Hall.—21 ft. 6 in. by 17 ft., and 18 feet high (not specially ventilated). Heated by two radiators, each 21 inches diameter and 3 feet high. Lighted by three Welsbach incandescent gas-burners.

Drawing Room.—22 ft. 6 in. by 26 ft., and 18 feet high. Ventilated by three ventilators on the west side only. Heated by one radiator on the north side, 4 ft. by 3 ft., one on the east side 4 ft. by 3 ft., and one on the west side 4 ft. by 2 ft. 5 in. Lighted by seven Welsbach burners.

Library.—22 ft. 6 in. by 17 ft., and 18 feet high. Ventilated by two ventilators on the west side only. Heated by one radiator on the east side 4 ft. by 3 ft., and one on the west side 4 ft. by 2 ft. 5 in. Lighted by two Welsbach burners.

Dining or Ball Room.—30 ft. by 45 ft., and 18 feet high. Ventilated by ten ventilators, five in the east and five in the west sides. Heated by six radiators, each 4 ft. 7½ in. long and 2 ft. 5 in. wide. Lighted by twelve Welsbach burners.

Café.—30 ft. by 35 ft. and 18 feet high. Ventilated by four ventilators, two on the east and two on the west side. Heated by two radiators, each 4 ft. by 2 ft. 5 in. Lighted by six ordinary gas-burners.



The accompanying illustration is a section of the dining or ball room. It is 18 feet high from floor to ceiling, and the roof is hermetically sealed, having no openings whatever. No special provision is made for the exit of carbonic acid from below, as the doors and usual cracks and crannies are found to be sufficient. The room is lighted by twelve Welsbach incandescent burners; so that there is considerable heat to be disposed of. Fresh air is admitted by ten inlets, five being on each side. These are set at about equal intervals apart along the room, and 2 feet below the springing of the roof or ceiling. Each inlet grating is provided with a sliding shutter, whereby the area open can be regulated. Although the air-bricks measure 11 in. by 16 in. outside, the clear area is but 30 square inches for each ventilator. The inlets to the room measure 16 in. by 3 in. = 48 square inches, or 1 square foot, and when tested by an anemometer the current varies considerably—generally reaching a speed of 300 feet per minute. Sometimes, however, the current is reversed. The results of these arrangements have been quite satisfactory. There is a complete absence of draughts as well as of those cold douches of Arctic temperature which make many assembly-rooms in town or country models of discomfort and veritable death-traps. Most of such rooms are decorated with a lavish generosity; while no care whatever is given to ventilation, scientific or otherwise. Such rooms are contentedly supplied with a big hot-air extractor in the roof, which creates all the draughts below; and the whole barbarous arrangements takes a toll of human life which it is perfectly appalling to contemplate.

In conclusion, the author summed up his views as follows: (1) Ventilation should, as far as possible, be carried out by the plenum and not by the vacuum system. (2) Fresh air should be introduced as an upward current from openings above the heads of an audience, but not so high as the ceiling. It should be driven in divided streams into the upper part of the room, so as to mix with warm air already travelling there. (3) Exits for

carbonic acid, dust, and watery vapour should be provided at or near the floor-level, if required. (4) The roof or ceiling of a properly ventilated chamber should be hermetically closed. (5) Open windows should only be used during warm weather, never in winter. (6) As natural draughts cannot always be relied upon, fans or a furnace, or other means of producing artificial draughts, should be resorted to, when necessary.

PARISH WATER SUPPLY AND SEWERAGE.

At the Meeting of the Society of Arts last Wednesday, under the presidency of Sir Benjamin Baker, K.C.M.G., a paper on "Local Government and its Relation to Parish Water Supply and Sewerage" was read by Mr. W. O. E. MEADE-KING, M. Inst. C.E., one of the Inspectors of the Local Government Board. The following are some extracts from the paper.

It will doubtless be allowed without comment that two of the most important duties of a local authority are to provide for the inhabitants under their jurisdiction (1) a proper, wholesome, and adequate water supply, and (2) a proper and efficient means of disposing of the sewage of their district. The question then arises: Do these authorities in the rural districts of England carry out in a proper and efficient manner the duties for which they are responsible? Perhaps it would be putting it too strongly to say the answer must be in the negative, as due allowance must be made for the many difficulties that present themselves; but certainly the information gained as the result of much investigation seems to point in the direction of a negative answer.

Under the Public Health Act, 1875, anyone who thinks he has sufficient grounds to do so can complain to the Local Government Board that the authority responsible for such matters in the district in which he resides or has property have made default in providing that district with adequate sewers, or that the water supply is insufficient or unwholesome. Persons making complaint as to an alleged improper water supply have to produce evidence to show that works to remedy the evil can be carried out at a reasonable cost, which naturally opens a very wide question, for, so far as the author is aware, no one has ever yet laid down any rule or principle on which a reasonable cost could be based.

It has been argued that if it can be shown that a scheme can be carried out for a sum not exceeding one year's assessable value of the district, it should be looked upon as reasonable. The following figures concerning 20 places which have come under the writer's immediate observation may be worthy of note, and may be of some assistance in deciding this point. The places in question had an average population of 2460, and an average annual assessable value of £9320. The average estimated cost of the scheme per place came to £1917, or about 15s. 7d. per head of the average population. In only one instance did the estimated cost of the scheme exceed one year's assessable value; in only three instances did it come near it; and in all the other cases it was very considerably below, seldom reaching one-half.

Should the complaint be one concerning sewerage, or rather the want of it, the necessity to prove that a scheme can be carried out at a reasonable cost does not exist. Nevertheless, it is interesting to note to what sum the average estimated cost of sewage-disposal schemes works out; and the following figures show that, in most cases, such a scheme need not cost anything like one year's assessable value. Fifty places have been taken which have come under the writer's notice during the last three or four years. Of these places the population varies from over 27,000 in one case, to about 500 in another; the average being about 4300. The average annual assessable value of these places comes to £19,850; varying from about £81,000 in one case, to about £1500 in another. The total estimated cost of sewerage and sewage-disposal schemes came to £228,183, or an average estimated cost per place of £4551, or rather less than a quarter of the average annual assessable value. The actual average estimated cost of the schemes per head of the population works out to £1 1s. 10d.

There are, at the present time, 7936 parish councils in England, to say nothing of the numberless parishes not possessing that luxury; therefore it will be readily understood that, in making inquiries concerning water supply and sewerage, it was necessary to limit the field to some extent. Accordingly, 200 parishes were selected at random; the writer having no previous knowledge of them. No parish was chosen having a population of less than a 1000 or more than 1500; and, for the purpose of making the information general, a few were taken from every county in England, exclusive of the County of London. Of these 200 parishes, 76 show an increase in rateable value during the four years 1894-8, 109 show a decrease, and in 15 cases the returns could not be obtained. The total rateable value of these 185 parishes in 1894 was £1,450,848, and in 1898 £1,432,029; showing a decrease in the four years of £18,819. It is believed, from observations made while professionally engaged in every part of the country, that the results of inquiries instituted concerning the 200 parishes chosen will convey very fairly accurately the state of all parishes throughout the country. It now remains to be seen what are the sanitary conditions under which these 200 parishes exist. Out of the 76 that can show an increase in their rateable value during the four years 1894-8, 20 obtain their water entirely from water-works; while out of the 109 showing a decrease of wealth in the same period, only 12 so obtain their water. Of those furnishing no returns as to rateable value, five obtain their water in this way; thus showing that out of these 200 parishes 37 are dependent entirely on water-works for their water supply, and that a substantial majority of them can show an increase in their rateable value. Looked at in another light, the figures prove that 26 per cent. of the parishes obtaining their water from water-works can show an increase in their rateable value, while only 11 per cent. of the parishes on a similar footing show a decrease. The advantages of a good and plentiful water supply laid on in a district are so manifold and obvious, that it is not intended by the author to enter into the merits of such a supply. Some parishes combine water-works and wells for their water supply—that is to say, water is laid on to the main part of a village, while isolated houses and farms, &c., are dependent on their own private wells. This is doubtless the next best form of supply to that from water-works only, and out of the total number of 32 parishes so situated, no less than 23 show an increase in their rateable value out of the 76, or 30 per cent., and only 7 out of the 109 parishes, or about 6 per cent., show a decrease. In two cases the rateable values could not be obtained. It is gratifying in a way to find that of the parishes dependent entirely on wells, of which there are 101 out of 200, only 23 out of the 76, or 30 per cent., show an increase in rateable value; while out of the total number of 109 which show a decrease, 71 parishes, or 65 per cent., thus get their water. Seven parishes dependent on wells give no returns of rateable value. The day is bound to come when every shallow well will have to be closed. Out of the 200 parishes taken, 24 obtain their water from a combination of wells, rain-water collected, ponds, &c.; but out of the 76 showing an increase in their rateable value, only 3 parishes, or about 4 per cent., thus get their water, and 20 parishes, or about 18 per cent., out of the 109 showing a decrease are dependent on this as the source of their supply. One parish in this category does not give any returns as to rateable value. Before leaving the subject of water supply, taken independently of sewerage, there yet remains one other form of supply—viz., parishes dependent on rain-water, wells, and water-works. Of these, there are two showing an increase in rateable value (being equal to 2·6 per cent.) and one a decrease, being equal to 0·91 per cent.; the fact of water-works forming even a part of the supply appearing in this, as in other cases, to have something to do with, if not to actually ensure, an increase in the rateable value.

It now remains to be seen what effect, if any, sewerage and sewage disposal, irrespective of water supply, have on the rateable value of a parish. Of the 200 parishes previously alluded to, 37 are sewered, and treat their sewage at disposal works. Of these, 3 give no returns as to rateable value; leaving 34 parishes which can be considered. It is found that 21 of these, or about 27½ per cent., show an increase, and only 13, or nearly 12 per cent., a decrease in the rateable value. It is satisfactory to find that those parishes which have gone to the expense of sewering, but go no further, and are offenders under the Rivers Pollution Prevention and other Acts, on account of discharging their sewage direct into a stream, should apparently suffer. Only 31 out of the 200 parishes dealt with do so, and one of these does not give any returns as to rateable value. Of those left, 10 parishes, or about 13 per cent., show an increase, and 20, or 18 per cent., a decrease in their value.

It would probably astonish people, did they but know it, what a number of parishes there are scattered throughout the country that are without any system of sewerage. These can, for present purposes, be divided into three classes: (1) Parishes not sewered, but causing pollution of a stream or streams by private drains. (2) Parishes draining by private drains into cesspits, but not causing pollution of a stream. (3) Parishes draining into cesspits, and by these overflowing, or by other means, causing pollution of a stream. In the first mentioned class, 19 show an increase in rateable value out of the 76 so doing, being equivalent to 25 per cent.; and 21 show a decrease out of the 109 in that predicament, being equal to about 19 per cent. It would thus seem that people do not care what becomes of their sewage, provided it is got rid of. As to the second class, 27 parishes out of 76, or about 35 per cent., have increased, and 45 out of 109, or about 41 per cent., have decreased in value. There remains the third class. This is about the worst form of getting rid of the sewage of a parish, and it is disappointing to find the honours so nearly divided as regards the rateable value. Out of the 200 parishes, 48 appear to be content to exist in this state; and of these, 17, or about 22 per cent., increased, and 26 out of 109, or nearly 24 per cent., decreased in value between 1894 and 1898.

Having now dealt with water supply and sewerage independently, it still remains to be seen what effect the two combined have on parishes. Out of the 200 places selected, only 23 get their water from water-works and are sewered to disposal works. But of this number no less than 15 out of 76, or over 19 per cent., have increased in rateable value, while only 6 out of 109, or about 5½ per cent., have decreased. Of parishes which obtain their water from water-works, but which are not sewered and drained to cesspits or streams, there are 25 out of the 200; and of those in which it is possible to compare the rateable values, some 16 out of 76, or 21 per cent., have increased, and

6 out of 109, or about 5½ per cent., have decreased in value—showing once more that, given a good water supply, the public care little what becomes of the sewage, so long as it disappears. As is well known, and as has been shown in this paper, the majority of parishes are dependent on wells of greater or less depth for their water supply; but some which are dependent on this source are properly sewered, and the sewage treated at disposal works. In such cases, the source of the water supply may very possibly be all that can be desired—provided, of course, none of the wells are liable to contamination by the sewage-disposal area or other polluting source. Only 21 parishes out of the total 200 are in such a state. But 12 out of 76, or nearly 16 per cent., show an increase; while only 8 out of 109, or about 7 per cent., show a decrease in their value—a margin which, once more, is greatly in favour of good sanitary conditions. The parishes having the worst sanitary conditions, so far as water supply and sewerage are concerned, are those dependent on shallow wells for the former, and at the same time are polluting streams and ditches, and making use of cesspits. Unhappily, these form the great majority; no less than 135 parishes out of 200 being in this condition. But it is some consolation to find that only 39 out of 76, or 51 per cent., can show an increase in rateable value; while 88 out of 109, or 80 per cent., show a decrease. The remaining parishes furnish no returns as to rateable value. The danger of such a state of things is too obvious for comment.

Before leaving the subject of the analysis of parishes, as regards their sanitary state and rateable value, mention must be made of one county alone where information regarding the source of water supply and means of disposing of the sewage was obtained from no less than 67 parishes. The result of this information goes to prove, first of all, the serious state of things which prevails; and, secondly, that good sanitary conditions enrich rather than impoverish the community. Of these 67 parishes, it was found that 58 (including one dependent to some extent on rain-water) rely entirely on shallow wells for their water supply, and 53 of them have no proper system of drainage, but turn their sewage into ditches and streams—thereby offending under the various Acts passed for the suppression of this evil, to say nothing of endangering their water supply—and, in addition, 5 use cesspits. Seeing what is done with the sewage, it is small wonder to learn that in the majority of cases the wells, on analysis, are pronounced to be suspicious, and in many cases dangerous and unfit for use. Of the total number of 67 parishes referred to, 42 give the returns of population at the last census (which varies from about 2500 to 300), also the rateable value in 1894 and 1898. It has been found that 22 parishes out of the 42 increased in value during those years; while the remaining 20 decreased—the balance showing a total increase in value of £9071. It is interesting to note that out of the 22 parishes which can show an increase in their wealth, eight obtain their water from water-works, and seven are sewered and treat their sewage at disposal works. Out of these 15 parishes, four both get their water from water-works and are sewered, the sewage being dealt with at disposal works; while out of the 20 parishes which show a decrease in their value, only one gets its water from water-works, and none have sewage-disposal works. The one getting its water from water-works has only decreased to the extent of £4 in rateable value.

Such, then, is the general state of parishes throughout the country; and yet it is said that nothing is more characteristic of the close of the nineteenth century than the extent to which sanitary science has come to the fore. It may have been, and no doubt has been, said; but it cannot be correctly said, so far as country parishes are concerned, that the desire for good sanitary conditions is much greater now than it was before the days of any legislation on the subject. So long as agriculture remains the staple industry of the country, the future prosperity must in a large measure rest with the parishes, the general tendency of which is not to increase materially in population. There is an outcry throughout the country as to the scarcity of agricultural labour. By carrying out proper works of water supply and sewerage, not only would labour be employed in the parish for the time being, but the general health and contentedness of the parish would be increased; and the fact of the sanitary arrangements being good would be an inducement to people to live there rather than seek the close confines of a large business centre. If the parishes produce weakly children by reason of insanitary conditions, both the towns receiving the rising generation and the parishes themselves, and therefore the country at large, must necessarily suffer. It is hoped the information gathered in this paper will be sufficient to satisfy local authorities and the public generally that money laid out on works of water supply and sewerage not only ensures health, but wealth.

The Carburetted Water-Gas Plant at Lower Sydenham.—In the description of the new carburetted water-gas plant at the Crystal Palace Gas-Works which appeared last week, mention was made of the method of re-circulating the water, &c. We have since been informed that this, with the settling-tank for the tar, and with the addition of cooling arrangements for the water, has been in use at the Windsor Street Gas-Works, Birmingham, for a considerable time. Something very similar, we understand, had also been previously employed at the Brentford Gas-Works.

REGISTER OF PATENTS.

Incandescent Gas-Burners.—Clay, W. R., of Bolton. No. 27,416; Dec. 29, 1898.

This is a modification of one part of the inventor's patented arrangement of 1897 (No. 17,679), as he says he finds that a better bunsen flame may be obtained if the secondary air supply at the neck of the upper part of the heavy burner body be cut off. In order to do this without injuring the efficiency of the arrangement as an anti-vibrator, he proposes to carry that portion of the apparatus which holds the spring very freely through the neck, and on the upper face of the neck to place a metal ring or washer, which shall surround the part carrying the spring or resilient bearing, and fit as closely to it as shall enable the spring-holding device to work freely up and down through or within the ring, and thereby not hinder the heavy body from promptly responding to any vibrations coming in a vertical direction. In order not to interfere with the sideway movement of the heavy body, the ring (being of larger outside diameter than the hole in the neck through which the spring-carrying device passes) rests or slides on the upper side of the neck, and thus forms a joint or packing closing up the annular space which would otherwise exist between the sides of the hole in the neck and the spring-carrying device freely passing through it.

Fig. 1 illustrates the application of the invention to an anti-vibratory device carrying a conical burner-top; and fig. 2, when carrying a burner-

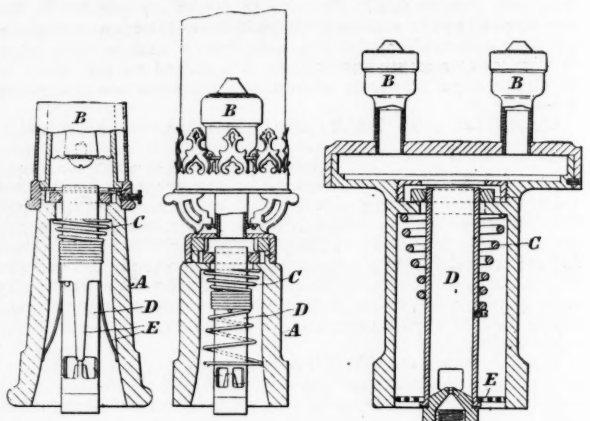


Fig. 1. *Fig. 2.* *Fig. 3.*

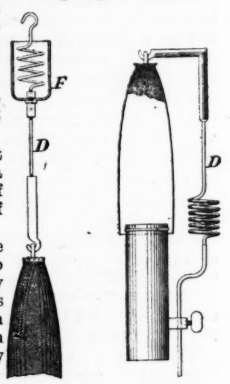
top of ordinary construction. Fig. 3 shows the application of the invention to a cluster of burner-tops.

A is the "heavy body" by which the burner-top B and mantle are supported, surrounding the bunsen tube. C is a spiral spring carried by the upper part of the bunsen tube D, and serving as a resilient bearing for the body. In fig. 1, there are radially-disposed spring-legs E placed below the spring, in order to check undue movement of the lower part of the body. In fig. 2 these spring-legs are replaced by a spiral spring. In fig. 3 is shown another alternative form of lower spring—a flat helical spring. The bunsen tube D here passes through the neck of the body A, so as to permit of free lateral play.

Incandescent Mantle-Supports.—Sugg, W. T., of Westminster. No. 2172; Jan. 31, 1899.

The patentee proposes to employ a pendent support for incandescent mantles, or a standard support; but in both cases it is of a flexible character—preferably consisting of a coil or coils of wire.

The part of the support from which the mantle is suspended is formed of steatite, to which the wire portion D is secured in any convenient manner. This wire portion is formed with coils to obviate vibration. In the pendent form, the coil is protected from the heat of the flame by a shield F, preferably of steatite.

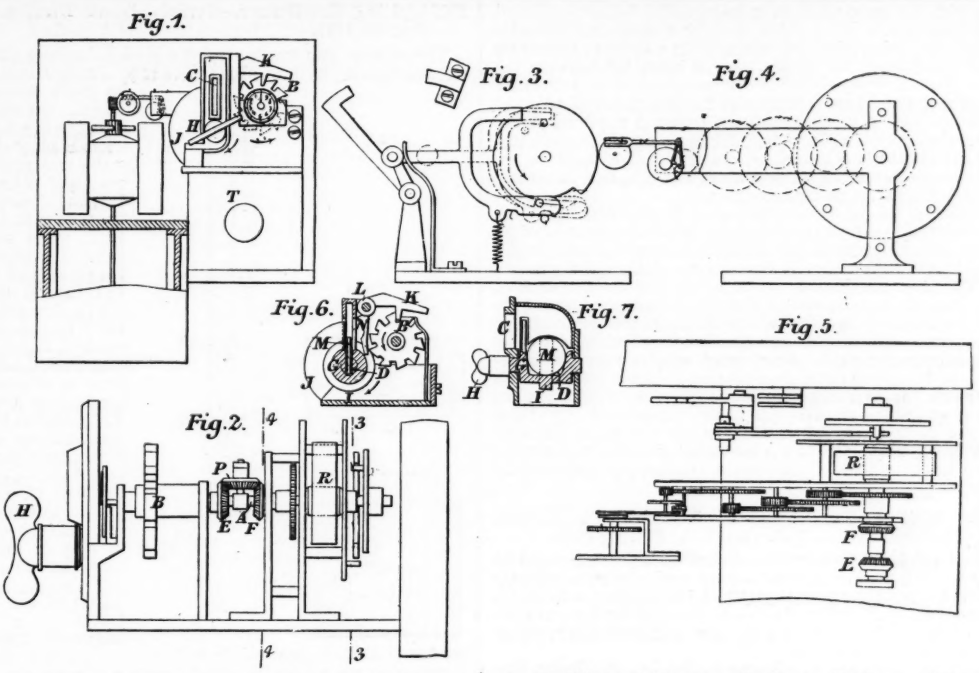


Coin-Freed Meters.—Abel, C. D.; a communication from the Société Anonyme Continentale pour la Fabrication des Compteurs à Gaz et Autres Appareils, of Paris. No. 27,390; Dec. 28, 1898.

This invention relates to coin-freed apparatus for electricity and gas or other fluid meters, so arranged that, by inserting a coin and turning a handle, two operations are performed by the movement given to the coin—first, the circuit of an electric meter is closed, or the valve of a fluid meter is opened, and then clockwork is wound up, which, after moving for a time (determined by the value of the coin and the price of the energy or fluid), opens the circuit or closes the valve, and comes to rest.

Fig. 1 (p. 471) is an elevation of the meter. Fig. 2 is a section of the clockwork; and figs. 3 and 4 are sections on the lines 3 and 4 of fig. 2 respectively. Fig. 5 is a plan; and figs. 6 and 7 are a longitudinal and transverse section of the parts immediately acted on by the coin.

The coin M, when introduced through a slot C, enters a notch D in the collar I of a spindle G, which is turned partly round by an external handle H. By its revolution, a shutter J is moved across the slot, so as to prevent the introduction of another coin. The shutter, acting on a lever-arm N, withdraws a pawl K; and the coin thereupon becomes engaged with the teeth of a ratchet-wheel B (which it turns one tooth),

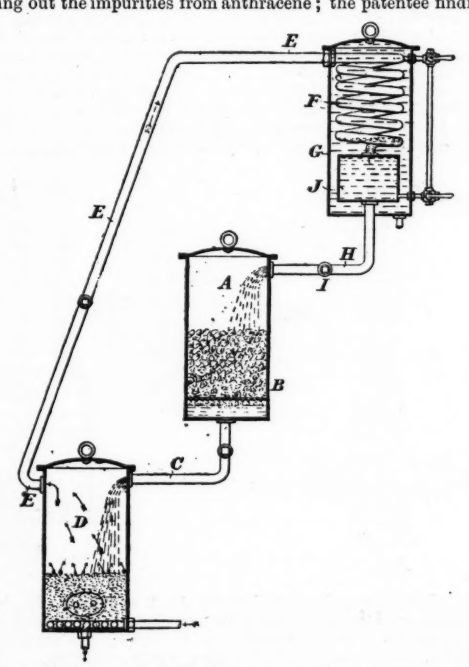


and then drops into a receptacle T below. The handle being then returned by hand or by a spring to its original position, a number of coins may be similarly introduced in succession, each turning the ratchet-wheel one tooth. The spindle on which the ratchet-wheel is fixed is connected through bevel-wheel differential gear to the spindle of a clock spring or weight.

The ratchet-wheel has on its spindle a bevel pinion E, gearing with a pinion P, which in its turn gears with another pinion F, and is pivoted at right angles on a separate axis A, to which one end of a spring R is attached—the other end being fixed to the framing. As the ratchet-wheel B turns while F is stationary, the spring is wound up by the axis A carried round by P. The pinion F is on a sleeve geared to a train of wheels and pinions governed by clockwork, which is moved by the spring, and which turns the axis A backwards, and also the pinion F, while the pinion E is stationary—the amount of movement backwards being equivalent to that forwards effected by the number of coins introduced. The clockwork is controlled by an escapement, which consists of an anchor acted on by a pin projecting from a disc driven by the clockwork. The anchor has a forked lever-arm engaging a stud on a disc on the axis of a wheel, which is moved by the counter of the meter. Each turn of the wheel causes a to-and-fro oscillation of the anchor, allowing the pin to escape; so that the wheel makes a revolution which permits the spring to unwind. When it is unwound as much as it had been wound by the act of introducing coins, the mechanism stops.

Manufacture of Anthracene.—Wilton, T., of Beckton. No. 27,559; Dec. 31, 1898.

This invention consists in a new or improved method of purifying or dissolving out the impurities from anthracene; the patentee finding that



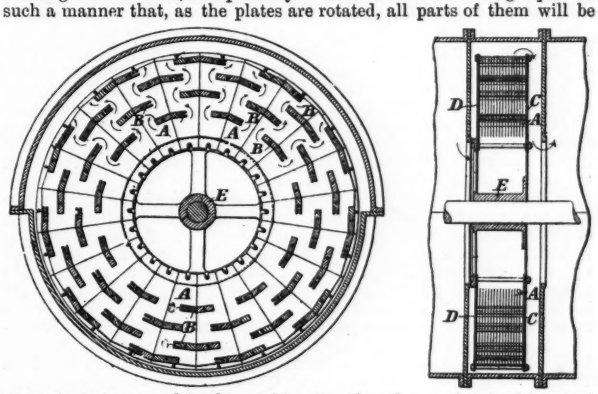
liquefied ammonia gas (NH_3) has the power of dissolving out most of the impurities in crude anthracene, while at the same time the anthracene itself is insoluble or practically so. By the use of liquefied ammonia gas, therefore, he claims to be able to obtain anthracene "of a higher commercial purity at little expense."

He describes one means of carrying his method into useful effect by such an arrangement of apparatus as that shown, which he has found to give good results, though he lays no claim to this particular apparatus, and any suitable means may be used. The apparatus consists of an air-tight receiver A, having a bottom strainer B. The lower part of the receiver (below the strainer) is connected by a pipe C to a lower vessel D. In order to render the process continuous, the lower vessel is connected by a pipe E to a coil-condenser F, situated within a vessel G, arranged at the upper part of the apparatus, and connected to the top receiver by the pipe H fitted with a stopcock at I.

In using this apparatus, the anthracene to be purified is pulverized and placed in the receiver A, and the whole apparatus made air-tight. The anthracene is then subjected to the action of the solvent ammonia by passing same through it in a liquid form, and under sufficient pressure to maintain liquefaction. During the process, the substance that is dissolved out of the anthracene under treatment by the selective action of the solvent runs in liquid form through the pipe C to the lower vessel D, from which it is subsequently removed. The anthracene which is not acted upon by the solvent remains in the vessel A, and may be removed therefrom. The ammonia, when in the lower vessel D, may be evaporated by heat or otherwise from the substances dissolved out; and the vapour of ammonia will then pass up the pipe E, and being re-condensed in the coil F will pass into the vessel J, and thence by the pipe H to the receiver A, when the cock I is opened. Thus the anthracene is left in an insoluble and highly purified state in the receiver A, and the ammonia solvent may be applied to the anthracene under treatment over and over again; the required pressure being maintained in the apparatus during the whole process.

Washers or Scrubbers.—Chandler, S. & J., of Kennington, S.E. No. 2832; Feb. 8, 1899.

This is a modification of the "Standard" washer-scrubber, the original patent for which was No. 2085 of 1881, wherein was described a series of plates, sheets, or boards (or of clusters of the same) arranged upon a rotating shaft or axle, and partially immersed in the washing liquid in such a manner that, as the plates are rotated, all parts of them will be



successively immersed in the washing liquid, and so maintained in a wet condition. The object of the present invention is "to provide improved means for maintaining the spaces or channels between the plates, sheets, or boards, and causing the gases which pass between to travel much further before leaving them than heretofore, whereby the gas is more effectually purified, and for providing carriers of any shape or number to distribute liquor over the surfaces employed."

The plates or boards are separated by distance-pieces of a breadth

corresponding with the space which is to be preserved between adjacent plates; the distance-pieces being either straight or curved or otherwise suitably shaped, and being preferably arranged in a series of concentric circles around the axis of the washer—spaces being left between the distance-pieces of each circle, while the distance-pieces of one circle are arranged opposite to the spaces between the distance-pieces of adjacent circles, so that the gas in passing from the centre of the drum to the exterior will have to flow in a zig-zag or circuitous passage. The distance-pieces are formed with hollows or recesses, which raise the liquid as the apparatus rotates, and allow it to drop again through, and in contact with, the gases flowing through the apparatus.

A are the plates, sheets, or boards; and B the distance pieces arranged between them—a series of the plates and distance-pieces being secured between the side-plates C D, and fixed to a boss E mounted upon a shaft carried in suitable bearings in the ends of a casing which encloses the plates. The casing is divided by partitions into bays, in each of which a series of plates rotates, and which at the bottom is adapted to be provided with the washing liquid which, as the plates are rotated, keeps them constantly wet. The boss E has two flanges, to which the side-plates are respectively connected. One is provided with a series of openings, and has its face running in close proximity to the margin of an opening formed in the adjacent partition; while the other side-plate extends right down to the second flange. This arrangement is provided in order that the gas to be purified—as it flows from one bay to the next, through the opening—shall pass to the interior of the cluster of plates; thence between the same; and thence to the next bay, as indicated by the arrows.

Automatically Igniting Gas.—Automatic Universal Gas Lighter, Limited, of Copthall Avenue, E.C. No. 3555; Feb. 17, 1899.

The patentees point out that igniting-bodies heretofore employed in conjunction with fine wires or filaments of platinum for automatically igniting gas, and comprising porous material impregnated with finely-divided metal—such as platinum black—are found to rapidly lose their automatic igniting property; and one object of this invention is to increase the durability of such bodies.

For this purpose, infusorial or silicious earth—*i.e.*, kieselguhr, in a pure and finely levigated condition—is formed, as heretofore, into small blocks (preferably of rectangular cross section), which are impregnated with a solution of salts of platinum and thorium; the impregnated blocks being dried and afterwards heated to a high temperature in a stream of reducing gas, such as hydrogen, to form the improved igniting-bodies. The invention may conveniently be carried out by placing the raw blocks of porous material in a solution composed of about 1 part by weight of bichloride of platinum (deutochloride of platinum), 0·4 part by weight of nitrate of thorium (thorium nitricum), and 4 or 5 parts by weight of water; the quantity of the solution used being such that the weight of the bichloride of platinum and nitrate of thorium therein is about three times that of the raw blocks to be treated. The blocks are allowed to remain for one or two hours in the solution, which is then nearly evaporated to dryness in a stove, at a temperature of about 60° C. The blocks are then placed on a plate of glass or the like material, and completely dried at a temperature of about 100° to 110° C., after which they are placed in a tube of hard glass, and gradually heated up to a high temperature in a stream of pure and dry hydrogen simultaneously passed through the tube. By this means, the salts of platinum and thorium are reduced; the platinum and thorium being deposited in a very finely-divided condition in the porous body, and water, chlorine, and hydrochloric acid being eliminated. When the elimination of these substances has nearly ceased, the temperature of the tube is raised still higher—to a white heat or nearly so, which is maintained until the white sublimate evolved during the heating is completely volatilized and the interior of the tube left quite clean. The source of heat is then removed, and the impregnated blocks, which will then be quite black, are allowed to cool in the stream of hydrogen gas until they attain a temperature of about 70° C., whereupon they are caused, as by inclining the tube containing them, to fall into a glass bottle or other like receptacle. The finished igniting-blocks are then ready to be mounted, combined with fine platinum wires or filaments to produce an automatic igniting-device.

Incandescence Bodies.—Duncan, J. H. H., of Coleman Street, E.C. No. 4243; Feb. 25, 1899.

According to this invention, incandescence bodies suitable for use with gas-burners are made of thoria, alumina, and chromium oxide in the proportion of 50 per cent. of thoria, 40 per cent. of alumina, and 10 per cent. of chromium oxide.

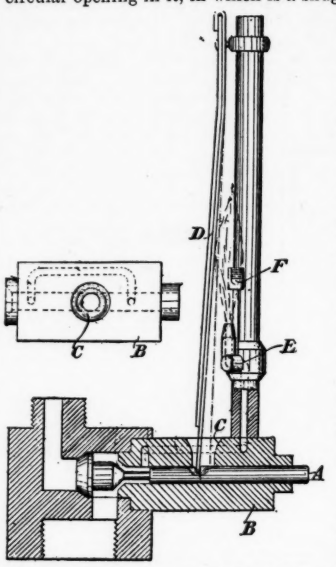
The incandescence bodies can be produced in various ways—for example, by impregnating suitable threads or fabrics with salts of the substances mentioned, and then converting the salts into their oxides by heating or otherwise treating the impregnated threads or fabrics in the usual way; by mixing the salts with collodion or other material that is afterwards converted into threads, which are suitably fixed and formed, by weaving or otherwise, into incandescence bodies of any suitable shape, and igniting them; or by any other process which results in the production of suitable filaments of oxides.

When the incandescence bodies are prepared by the impregnation process, the thorium, aluminium, and chromium, which are to be in the form of oxides in the finished body, may be added to the impregnating solution as thorium nitrate, aluminium nitrate, and chromic acid, in such proportions that the thoria, alumina, and chromium oxide present in the mixture will be in about the proportions mentioned. When the incandescence bodies are made from filaments or threads produced from a mixture containing collodion or some other solution of a combustible substance, the thorium nitrate, aluminium nitrate, and chromic acid may be dissolved in a solvent of the combustible substance, and in this form be added to the collodion or other solution of a combustible substance.

Although the proportions named of the various substances used, if strictly adhered to, will (says the patentee) give most satisfactory results with the methods of manufacture and burning off now in use, yet it is not intended to limit the scope of the invention rigidly thereto, as the proportion of thoria may be varied considerably so long as the alumina and chromium oxide are retained in the relative proportions mentioned, or "in variations of the same that will allow of, or at least will not prejudice, the chemical combination of these two substances."

Self-Igniting Gas-Burner.—Perlich, A., of Dresden. No. 13,556; June 30, 1899.

The patentee proposes to employ a block B, having a central horizontal circular opening in it, in which is a snugly-fitting valve-stem A, adapted to move backwards and forwards. On the forward end of the stem is a double valve—the former adapted to rest in a valve-seat provided in the forward end of the circular opening, and closing the same when the stem is in a backward position; while the latter valve engages a valve-seat formed in the passage of the head-piece, and closes it when the stem A is in a forward position. The block is also provided with a passage, which forms a continuous channel from the head-piece to the hollow tube supporting the self-igniting mass F. Adjacent to the latter is mounted an expanding and contracting plate D, the lower end of which, passing through the hole C, engages the lip formed in the stem A. Thus when the gas-cock (not shown) is opened, the gas entering through the head-piece travels to the self-igniter, which latter, acting in the usual manner, ignites the gas at the small burner E. The flame, acting on the plate D, causes a deformation of the plate, by which action the lower end engaging the lip drives the stem A backward, and closes and opens the respective valves; and the gas passes to the burner, and is ignited.

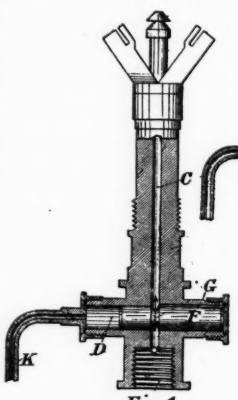


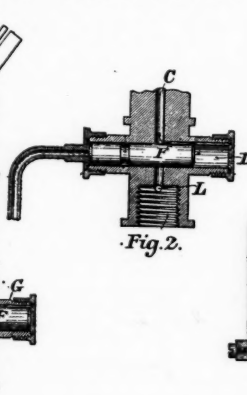
Fly-Wheels of Explosion Engines.—Otto, M., of Neuilly, France. No. 17,210; Aug. 24, 1899. Date claimed under International Convention, Feb. 24, 1899.

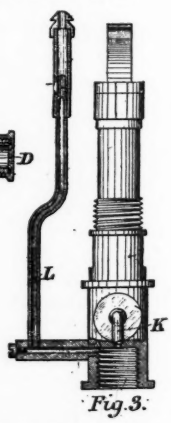
The patentee claims to have invented a means of turning to account the energy stored by the fly-wheel of (say) a gas-engine, not only to regulate the speed and work of the engine, but also to accumulate an additional energy, which remains constantly available for starting purposes. He proposes to substitute for the simple mass of metal now employed, a dynamo placed on the main driving-shaft of the engine, and the moveable parts of which are connected with a mass of metal forming a fly-wheel. This dynamo—which, moreover, may be of any type, and can be series shunt or compound—will not only act as fly-wheel, but will also feed, during the working of the engine, a battery of accumulators, and will be able, in addition, to supply the electric current requisite for an electric device of any kind for igniting the explosive mixture. When, after the stoppage of the engine, it is wished to set it working again, it will suffice to reverse the direction of the current by the aid of a reversing commutator; and the dynamo fly-wheel, receiving the current from the battery of accumulators, will immediately transform part of the electric energy accumulated into mechanical energy for starting the motor. When this last has acquired its normal speed, the commutator is replaced in its ordinary position.

Actuating Gas-Burners from a Distance.—Weber-Marti, C. A., of Zurich, Switzerland. No. 18,874; Sept. 19, 1899.

This invention is characterized by "the provision at a suitable point in the gas-conduit of a chamber connected both to the gas-conduit and the atmosphere by a particular duct and to the supply of the controlling air, and of a piston having a flow-through channel to communicate with the through-way of the conduit, and adapted to work hermetically in the chamber cross-wise of the conduit through-way, and to be moved with its flow-through channel into or out of communication with the conduit through-way by compression or exhaustion of the controlling air acting in the chamber, respectively by the action of the atmosphere."







As applied to an acetylene gas-burner, fig. 1 represents the device in sectional elevation, showing it open for the through passage of the gas. Fig. 2 illustrates the device closed so as to prevent the passage of the gas; and fig. 3 represents a side elevation, partly in section.

The gas-conduit B is formed with two through-ways or passages C D, crossing each other at right angles. C serves for the passage of the

gas to the point of ignition, and D serves to receive a piston F, having a peripheral groove by means of which the gas passes through C as required. One end of the through-way D is closed by a coupling communicating with suitable air supply and exhaust apparatus (not shown) by a pipe K; while the other end (closed by a cap) communicates with the outlet-passages C and the atmosphere, by a duct G made in its upper wall.

When it is desired to permit of the passage of the gas through the channel C, air is forced through the pipe K into the adjacent end of the chamber D. This causes the piston F to assume the position indicated in fig 1, which allows the gas to pass the peripheral channel in this portion. When it is desired to prevent the passage of the gas, air is exhausted from the chamber D, through the pipe K, when the pressure on the other end of the piston causes the latter to assume the position in fig. 2, which prevents the gas passing the peripheral channel.

From the lower part of the through-way C, a conduit L leads to the igniting device, which consists of a gas-nozzle, above which is fitted an air and gas mixing-tube having an air-inlet, and fitted at its top with a removable burner (or there formed as a burner) having a less bore than that of the mixing-tube, so as to prevent the bunsen flame striking back.

Gas-Engines.—Lake, H. H.; a communication from the Standard Automatic Gas-Engine Company, of Oil City, Penn., U.S.A. No. 20,664; Oct. 14, 1899.

This invention—relating to a gas or explosion engine, and having for its objects to simplify the valve mechanism, to render the igniter more reliable, to improve the means for cooling the piston, and to provide simple and efficient means for starting the engine—is not described apart from a series of detail drawings accompanying the specification.

Manufacture and Purification of Alkaline Cyanides.—Wilton, T., of Beckton. No. 24,307; Dec. 6, 1899.

This invention relates to the manufacture and purification of alkaline cyanides—such, for example, as cyanide of potassium, sodium, and so forth—by a method whereby in the manufacture it is possible to separate or dissociate the alkaline cyanides from mixtures or compounds containing them, and so obtain cyanides of a higher commercial purity and at but little expense.

The patentee states that he has found that liquefied ammonia gas (NH_3) has the property, when properly applied to mixtures containing alkaline cyanides, of dissociating (by dissolving out therefrom) either the cyanides or the impurities present with them, according to which is the most soluble. Liquefied ammonia gas is a solvent which does not in any way injure the cyanide, and has a selective action in dissolving out certain salts; and it is this special property that he utilizes. In carrying out the invention, the mixture containing the cyanide or cyanides is subjected, when in a reduced or powdered condition, to the action of the liquefied ammonia gas under suitable pressure; and to render the process continuous, the ammonia is evaporated from the dissolved portion, whether it be the cyanide or the impurities, and then recondensed in a coil ready for re-use, while the separated cyanide is left in a highly purified state.

The form of apparatus employed, and its mode of operation, are exactly similar to that specified in patent No. 27,559 of 1898 (*ante*, p. 271). Substitute the word "cyanide" for "anthracene" in the above-named description of the illustration, and the patentee's meaning is clear. He concludes his specification by saying: "The process will, as above indicated, vary according to the particular cyanide under treatment. For instance, in the treatment of potassium cyanide, when it is less soluble than the impurities with which it happens to be mixed, the cyanide will remain in the first vessel, while the impurities will be deposited in the lower vessel D; and as the solubility of different cyanides varies, it will be obvious that the same method can be used for the purpose of dissociating or separating them from each other. For example, cyanide of potassium may be separated from cyanide of sodium by fractional solution; the latter being more soluble in liquefied ammonia gas. The process is applicable to all alkaline cyanides; the above instanced being examples of the process and the mode of application."

APPLICATIONS FOR LETTERS PATENT.

887.—Abel, C. D., "Gas-engines." A communication from the Gasmotoren Fabrik Deutz. Jan. 15.

905.—Graetz, A., "Burners for light carburetted hydrogen gas." Jan. 15.

910.—Knapp, W., and Steilberg, R., "Production of compressed gas." Jan. 15.

1049.—Vaillant, J., "Gas-regulator for water-heaters." Jan. 17.

1085.—Hagger, W. T., "Column or post lamps." Jan. 17.

1086.—Paterson, B., "Prepayment gas-meters." Jan. 17.

1093.—Abel, C. D., "Gas-engines." A communication from S. L. y Fernandez. Jan. 17.

1097.—West, J., "Charging machine for gas-retorts." Jan. 17.

1235.—Hautier, C., "Gas-engines." Jan. 19.

1241.—Clay, C., "Conveyors." Jan. 19.

1262.—Crowther, A., "Gas-burner." Jan. 20.

1292.—Jensen, P., "Gas-lamps." A communication from V. Margonari. Jan. 20.

1297.—Vickery, A., "Conduits for underground pipes." Jan. 20.

1311.—Sheftel, M., "Mantles for lighting by incandescence." Jan. 20.

Faversham Town Council and the Water Company.—A Committee appointed by the Faversham Town Council to consider the desirability of purchasing the Water Company's undertaking have received an intimation from the Local Government Board to the effect that they would not be prepared to sanction a loan for the purchase of the undertaking, as the Company are supplying Oare (an outlying parish) with water. The Company have just completed a reservoir capable of storing a million gallons of water, and are boring a well at a depth of 120 feet.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Projected Amalgamation of the Gas Institute and the Institution of Gas Engineers.

Sir,—It will be within the knowledge of many of your readers that certain steps have of late been taken towards bringing about the much to be desired reunion between the Gas Institute and the Institution of Gas Engineers; and some information as to the progress that has so far been made in this direction will doubtless be of interest.

The Councils of the two Institutions have, after careful consideration, arrived at the conclusion that, provided satisfactory rules can be formulated governing the qualifications of members, reunion is desirable. They have, therefore, each nominated five members to form a Joint Committee for the consideration of the whole matter, and for the drawing up of an amended set of rules.

This Committee has already held one meeting, at which it is pleasing to note great unanimity prevailed. It is proposed that the result of its deliberations, together with a copy of the proposed rules, shall be laid before the two Councils at an early date; and, if they are considered satisfactory, the whole matter will be brought forward at the annual meetings of the two Associations in May and June next, and propositions submitted for the dissolution of both Associations, and the formation of a new and combined society.

It was at first thought that the procedure in the case of those members of the Gas Institute who are engaged in trade would form the main difficulty; but, from information laid before the Committee, it appears that this is not likely to prove so formidable a stumbling-block as was anticipated, for it is understood that the majority of such members are so desirous of seeing the amalgamation effected that, rather than put any obstacle in the way of its accomplishment, they are willing to resign their membership forthwith.

Of course, no final steps will be taken until the whole question has been thoroughly discussed by both Institutions; and it is the intention of the respective Councils to send to each member prior to the general meeting, a copy of the suggested rules, and of the proposals dealing with the question of dissolution and re-formation.

J. W. Helps and A. Dougall,
for
Jan. 26, 1900. The Joint Committee.

The Recovery of Cyanogen from Coal Gas.

Sir,—In the "Journal," No. 1913, of Jan. 9, an article with the heading "Dr. Bueb's Cyanide Recovery Process" has appeared. In the article it is admitted that my process, in some essential points, differs from the Rowland process; but at the same time it is suggested that my process is identical with the one which for some time past has been in use at Beckton. As it is further said that, until my publication became known, the Beckton process has been kept secret, I can as regards publications on this process only refer to Mr. Methven's presidential address at the meeting of the Institution of Gas Engineers in 1893, which you also mention in your article.

On that occasion Mr. Methven verbally said: "Ammonium ferrocyanide is consequently produced in the washer; and the solution is then removed to the products works, where by a special process the prussian blue is obtained." Therefore, according to Mr. Methven's communication, a compound closely characterizing the ammonium ferrocyanide, and this in solution, is being recovered. By my process a double salt, of a molecular composition totally different from ammonium ferrocyanide, as precipitate in the form of a solid compound, is gained. Here is a contradiction which requires clearing up before it can be sustained that the process as worked at Beckton and mine are identical. If I am rightly informed, the several works of the Gaslight and Coke Company do not employ special apparatus for separating the tar (the Pélouze apparatus); and the separating of the tar is effected in tower scrubbers together with a partial separation of ammonia. Experience has shown that my process can only be carried out at works where the gas, after having been condensed, passes directly through a dry tar separator, and then immediately (with its full contents of ammonia) into a cyanide washer. The previous passing of the gas through a tower scrubber causes so much loss of ammonia, that it renders my process impracticable. It would be interesting to know whether at the different works of the Gaslight and Coke Company the tower scrubbers have now been removed, and, if this is the case, since when.

Your article concludes by saying that with the Beckton process a separation of liquid from the precipitate does not take place; and it is also presumed that the same applies to my process. I beg to state that this is not so. The Gaslight and Coke Company being, however, as shown in the present case, in the habit of concealing their methods of working, there is for the present no reason for my entering into further details as to my process.

If I consider the leading position which the Gaslight and Coke Company pretend to occupy in gas matters, I cannot understand how this Company could have foregone taking out a patent for their mysterious process of recovering cyanides. By doing this, the Company could have shown that they were actually working by a new process quite apart from securing thereby to themselves greater advantages than by wrapping themselves up in a mystery.

Dessau, Germany, Jan. 25, 1900. Dr. T. Bueb.

Sir,—As a contribution to current literature on the above subject, I have read with great interest the *résumé* which you recently published in the "Journal" on Dr. Bueb's cyanide recovery process. Up to the present time, the recovery of cyanogen products does not appear to be accompanied by any profitable return; but any fresh attempts in this direction must be welcomed as at least of scientific interest, if not of commercial value.

There is perhaps but little criticism to offer as to rival processes; but, with all deference to Dr. Scharrer, he seems to me to pose quite as much

as an advocate of the Bueb process, as an exponent of scientific facts. The most interesting fact to learn as to the practical working of cyanogen recovery, is that, by a comparatively simple process, the cyanogen in coal gas can be totally eliminated in the marketable form of potassium ferrocyanide. The method is clear up to the detail of the treatment of the sludge and liquor for the production of the finished product; but with regard to this no particulars are given. Dr. Scharrer is, however, very strong in his claims for eliminating cyanogen from coal gas, apart from the commercial value of the eventual product obtained; and it is in this that his statements are open to criticism. He is, of course, speaking all through upon Continental practices in purification, &c., and his experiences are evidently derived from this source.

Categorically the claims of the benefits derived from purifying gas from cyanogen are as follows, with special reference to the Bueb process:

1. That the free cyanogen which is inevitably present in gas made and purified in the ordinary way, is "taken up by the water in the gas-holder tank, which is thereby rendered poisonous, or it corrodes the plates of the holder and the meter drum, and may even be consumed with the gas."

2. That by the adoption of the special process, a portion of the ammonia is removed from the gas, which "relieves the ordinary scrubbing plant, and the yield of ammonia is increased."

3. Moreover, "the oxide may be far more completely exhausted than hitherto in the removal of sulphuretted hydrogen from the gas, as it has only this (its proper) function to perform, and is not partially utilized in absorbing cyanogen and ammonia."

4. At gas-works in which the process has been in use for a year, "the spent oxide has been found to contain over 50 per cent. of sulphur."

There are other minor details which need not be noticed; but it may be stated, with regard at least to current experience in English works, that as far as the knowledge of the writer extends no poisoning of the water of gasholder tanks or of corrosion of gasholder plates and meter-drums has ever been traced to the presence of cyanogen; and even if "consumed with the gas," there is no special harm in the combustion products (nitrogen and carbon dioxide).

Further, although the elimination of cyanogen is inevitably accompanied with the removal of a corresponding amount of ammonia, this cannot be claimed as a material advantage in relieving the ordinary scrubbing plant or in increasing the yield of ammonia. Efficient scrubbing plant is capable of removing the whole of the ammonia in a comparatively costless way, without employing such an expensive adjunct as sulphate of iron.

With regard to the duty of oxide on sulphuretted hydrogen, there cannot be much mischief from cyanogen and ammonia, considering that it is customary to work up the oxide before sale to from 50 to 60 per cent. of sulphur on the dry basis.

Taking into general consideration the whole question of the Bueb process, it appears to me that the value of the elimination of cyanogen by this method is solely dependent on the market value of the cyanides obtained.

H. Leicester Greville.

Jan. 23, 1900.

The Boston Retort-Oven Gas Plant.

Sir,—In your issues of Nov. 7 and 14, 1899, you published two articles based on my previous publications in "Progressive Age." It is with a great deal of pleasure that I notice that the "Journal" has taken a kind and earnest interest in our enterprise. I think, therefore, you may wish to look over the short article published in the issue of Jan. 1 of "Progressive Age," where a few data regarding the quality and quantity of the surplus gas are given.* It only remains to be added that up to the present time steady improvements have been made, even over the figures given in the article. The quantity of gas produced has been increased to almost 4000 cubic feet per gross ton of coal. The illuminating value remains between 18 and 19 candle power. It is expected to still further improve the quantity obtained per gross ton of coal. The amount of purified gas supplied to the gas-works is 3,500,000 cubic feet per day. The mains connecting the plant with two other Gas Companies are now being filled.

On p. 1176 of the "Journal" a few remarks are made regarding which I beg to offer some information. It is stated that the slack coal from Cape Breton enters the United States on the basis of 15 c. duty per gross ton. It was omitted to state accurately the amount of drawback allowed by the United States Government for export shipments of coke. You say: "The amount is not stated, so that we cannot say whether or not it is sufficient to be called a bounty." The amount of drawback, as fixed by the United States Custom-House, is arranged upon the basis that all the products obtained by the distillation of one gross ton of coal will share in the total drawback of 15 c. (less 1 per cent. for Custom-House expenses); so that the amount of drawback allowed on coke is fixed by the percentage obtained, and must be less than 15 c. I will not occupy any more of your space by figuring this in detail.

Furthermore, it should be mentioned that the price of gas as charged by the Massachusetts Pipe-Line Gas Company is 20 c. per 1000 cubic feet of 12-candle power gas. As the Pipe-Line Company are now furnishing a gas of very much higher candle power, they expect to receive a higher price, based upon a fixed valuation per 1000 candle feet.

The fact that the gas is not sold directly by the New England Gas and Coke Company to the consumers is cited as a "curious illustration of the complexity of the financial side of this enterprise." The gas situation in Boston—*i.e.*, the so-called "Gas War" between the several factions, to control the gas supply of the city of Boston and its suburbs—has truly been a perplexing one; but this has absolutely nothing to do with the operations of the New England Gas and Coke Company. The Company manufacture a gas of high candle power as a bye-product of its extensive coal carbonizing operations. They sell this gas to the Massachusetts Pipe-Line Gas Company, who in turn sell it to the local Gas Companies at a price lower than these Gas Companies can produce it by either the coal or water-gas processes. It is a matter of indifference to the New England Gas and Coke Company, who control the gas-works in and around Boston, because their market for this gas is assured as long as they are in a position to continue the manufacture of gas at a lower cost.

Mr. Whitney's motives in separating the Massachusetts Pipe-Line Gas Company (as the distributing agent) from the New England Gas and Coke Company (as the producing agent) can be easily understood. The Gas Companies in Massachusetts are under the control of the Board of Gas and Electric Light Commissioners of Massachusetts. If Mr. Whitney's entire scheme had depended upon the sanction of any State Board, it is certain it never would have been carried out. Such gigantic and novel departures can be called into existence only if private enterprise is unhampered by State Boards, whose conservatism would soon exhaust even the greatest amount of energy available in a single man.

The plan upon which the New England Gas and Coke Company were conceived and carried out, involved no risk whatever that their failure would result in any additional burden to the gas consumers. On the contrary, their failure would have resulted only in a great loss to Mr. Whitney and his associates. In case, however, the plant would be a success, great benefit to the community would be the immediate result. This has already been evidenced by the reduction in price of gas made by the Companies which purchase their gas from the Massachusetts Pipe-Line Gas Company. Herewith is their announcement in full—

"The undersigned hereby give notice that, having arranged with the Massachusetts Pipe-Line Gas Company for the purchase of coal gas at a lower price than that for which they have hitherto been able to manufacture it, they will supply coal gas in place of water gas whenever the said Massachusetts Pipe-Line Gas Company is ready to furnish it. From and after that time, the price of gas used for fuel, when supplied through a separate meter, will be 75 cents per 1000 cubic feet; when used in gas-engines, of a type to be approved by the Company furnishing the gas, $1\frac{1}{2}$ cents per horse-power-hour, up to 100 horse-power; in engines from 100 to 200 horse-power, $1\frac{1}{10}$ cents per horse-power-hour; in engines of 200 horse-power and over, 1 cent per horse-power-hour; for gas supplied to gas furnaces, of a type to be approved by the Company furnishing the gas, 50 cents per 1000 cubic feet. All interested parties are requested to communicate with the undersigned at their several offices, who will be pleased to give information in regard to the kind of apparatus best adapted to accomplish a satisfactory result.

Brookline Gas Light Company, by E. G. Storey, Treasurer.
Dorchester Gas Light Company, by F. P. Addicks, Treasurer.

The Jamaica Plain Gas Light Company will join in the prices above named, and will reduce its price for illuminating gas from $1.25 to $1 per 1000 cubic feet whenever the Massachusetts Pipe-Line Gas Company is prepared to supply the gas for which the Company has already contracted.

Jamaica Plain Gas Light Company, by E. N. Foss, Treasurer."

This reduction has actually gone into effect on Jan. 1; and the Jamaica Plain Gas Light Company are now selling illuminating gas for $1 per 1000 cubic feet.

You also have some misgivings regarding the possibility of establishing a satisfactory market for the large quantity of coke produced by the New England Gas and Coke Company. The article in the issue of Jan. 1 of the "Progressive Age" states with what success the coke has met in New England. "*L'appetit vient en mangeant.*" The New England Gas and Coke Company cannot supply the demand for coke which they have created; and a large extension of the plant is under consideration.

There is a strange confusion of facts in the statement regarding the sale of the Everett works to the Dominion Iron and Steel Company of Nova Scotia. Neither Mr. Whitney nor Mr. Elkins is in any way discouraged regarding the result of the plant. On the contrary they are very enthusiastic over its present achievements and future prospects.

Mr. Whitney is also President of the Dominion Iron and Steel Company who are now building an enormous blast-furnace and steel plant at Sydney, Cape Breton. This Company will draw their coal supply from the same source—*i.e.*, the Dominion Coal Company—as the New England Gas and Coke Company.

Mr. Whitney has placed with the United Coke and Gas Company the contract for the erection of another plant of 400 Otto-Hoffmann ovens at Sydney, for the Dominion Iron and Steel Company, which plant is now in course of erection, and will be completed in the fall of this year. This has probably caused the confusion in your statements. The gas from these coke works will be consumed by the steel plant in its open-hearth furnaces.

There is also a remark on p. 1176 regarding the disposal of the tar produced by the New England Gas and Coke Company. The entire tar production is sold to the National Coal Tar Company for five years. This is not a "daughter concern" of the New England Gas and Coke Company. The parties interested in the New England Gas and Coke Company have absolutely no interest in the National Coal Tar Company. It is a *bonâ-fide* sale, based on current prices of tar in this country.

It is easily understood that tar distillers and roofing paper manufacturers were somewhat disturbed by the news of the impending production of tremendous quantities of tar at Everett. Consequently, the New England Gas and Coke Company asked the writer to prepare plans for their own tar distillation works, which were immediately commenced, when the offer from an independent tar concern was made which resulted in this sale at a figure satisfactory to the Coke Company.

You will excuse my being explicit on all these points, because a great deal of maligning has been done for the purpose of impeding the progress of the New England Gas and Coke Company. Ordinarily, no attention has been paid to any incorrect statements; but it is not our desire to see these enter the columns of your paper without correction on our part.

In conclusion, we want to state that many pages can be filled with descriptions and statements about the Everett works; but they will not convey a true conception of the magnitude of the enterprise. In case you or any of your readers will not shun a trip to Boston, they may be assured of a cordial welcome, and we will gladly permit an inspection of the plant.

The United Coke and Gas Company.
per Dr. F. Schniewind.

Everett, Mass., U.S.A.,
Jan. 9, 1900.

* The article referred to by our correspondent was reproduced last week, p. 205.—Ed. J.G.L.

The Water-Gas Plant at Halifax.

Mr. T. Holgate, the Engineer and Manager of the Halifax Corporation Gas-Works, writes, in reference to the statement in the "Journal" for

the 2nd inst. (p. 45) as to the non-completion of the carburetted water-gas plant there being due to the fact that "the contractors were behind with their work," that the mode of expression employed might possibly lead some of our readers to suppose that the Economical Gas Apparatus Construction Company, Limited, were the "contractors" referred to. This is not the case. The enlargement of the plant has involved the employment of many firms, who have had difficulty in obtaining material; and this consequently delayed the execution of the work. It was to this general fact that Mr. Holgate referred in the interview we reported.

Wet Lime Purifiers for Carburetted Water Gas.

Mr. G. W. Anderson, of Caterham, asks if any of our readers can inform him whether wet lime purifiers have been tried for carburetted water gas; and, if so, with what result?

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1900).

Opposition on Standing Orders.

On Tuesday last, the final day for depositing memorials complaining of non-compliance with Standing Orders in the case of the remaining Bills in the General List of Petitions, no memorials had been received in respect of those in which our readers are interested. The following Bills will not, therefore, be opposed on Standing Orders: Lymington Corporation Gas and Electric Supply Bill, British Gaslight Company (Staffordshire Potteries) Bill, Fishguard Water and Gas Bill, Mid-Kent Water Bill, Edinburgh District Lunacy Board Bill, Spalding Urban District Council (Water) Bill, Paignton Urban District Water Bill, Gaslight and Coke, Commercial Gas, and South Metropolitan Gas Companies Bill, Glyncorrwg Urban District Council Gas Bill, Lee Conservancy Bill, Otley Urban District Council Water Bill, Morley Corporation Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Hemel Hempstead Corporation (Water) Bill, Woodbridge District Water Bill, Salford Corporation Bill, South Metropolitan Gas Bill, Gwyrfai Rural District Council Water Bill, Rugeley Gas Bill.

The memorials complaining of non-compliance with Standing Orders in the case of the petitions for the South Essex Water Bill and the South Essex Water Board Bill have been considered by the Examiners, who decided that the allegations had not been sustained. Last Friday, the memorial of Mr. John Griffiths, complaining of non-compliance in the case of the petition for the London Water (Welsh Supply) Bill was considered. The alleged non-compliance consisted in the omission from the books of reference of properties of which the memorialist is owner, and affected by the scheme, and the absence of the necessary written application to him with respect to those properties; and, further, the failure to deposit plans, &c., with the Clerk of the Parish Council of Guarafog, in which the properties are situated. In the course of the inquiry, it transpired that notices had been served on Mr. John James Griffiths, of Highbury, the father of the memorialist, with regard to certain properties, including those in question. Mr. J. Griffiths said the property had been in his hands for seven years. Mr. Cripps, who appeared for the promoters (the London County Council), submitted that they had complied with the Standing Orders in naming the "owners or reputed owners." A referencing expert stated that the people in the neighbourhood told him that the ownership of the various properties was vested in "Mr. Griffiths down at the hotel." That was Mr. J. J. Griffiths. He had heard nothing of Mr. John Griffiths. The Examiner said he considered that, under all the circumstances, the promoters were quite justified in regarding Mr. John James Griffiths as the reputed owner of the properties. He declined to sustain this allegation of the memorial; and the others were not proceeded with.

Shifnal Water Supply.—At a recent special meeting of the Shifnal District Council, a report of the Joint Committee to consider the East Shropshire Water Company's Bill was presented. It stated that there were great differences of opinion on the subject in the several districts comprised in the proposed area; and it was resolved that the Special Committee be empowered to join with the other Committees of the Dawley and Oakengates District Councils in securing expert engineering and legal advice upon the Bill—the Clerk of each Council to submit a case to the Engineer and Counsel employed; it being provided that the Shifnal Council should pay one-third of the costs incurred.

The Spalding Water-Works Purchase Bill to be Proceeded With.—Last Tuesday, a town's meeting was held at Spalding, to consider the question of the purchase by the town of the undertaking of the Spalding Water-Works Company. The Chairman of the Urban District Council presided, and moved a resolution sanctioning the Council's Bill for the purchase of the undertaking. It transpired that a provisional agreement has been made with the Directors of the Company for the purchase of the undertaking, which is now awaiting confirmation by the shareholders. Until the matter had been before the shareholders, it was not thought desirable to state the amount of the purchase price, but it was calculated that not more than £26,000 or £27,000 would be required to cover the total expenses. The loan was proposed to be repayable over a period of fifty years, which would require an annual payment of £1150 to cover instalments of principal and interest. The income from the works had been about £1000 a year—leaving £150 a year to be raised by a rate of 1½d. in the pound. It was thought that a rate of a few pence for a few years might be necessary, but that afterwards the increased revenue would cover the expenditure. The resolution authorizing the Council to proceed with the Bill was unanimously adopted. It was mentioned that very considerable improvements were contemplated in connection with the water-works—both as to the quantity and the quality of the supply—if the undertaking were acquired by the town.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of the above-named Company for the six months ending Dec. 31, 1899, which, with the accounts for this period, will be presented to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance available for distribution of £560,663 15s. 1d., out of which the Directors recommend a dividend on the ordinary stock at the statutory rate of £4 18s. per cent. per annum, carrying forward the sum of £193,333 8s. 4d. to the credit of the current half year.

The Directors report with great satisfaction a material increase in the sale of gas during the half year. The quantity sold was 10,764,044,000 cubic feet, which compares with 10,259,258,000 cubic feet sold in the December half year, 1898; showing an increase at the rate of 4·92 per cent.

The improvement in the sale of gas has been accompanied by an equally satisfactory improvement in the revenue from residual products, with the result that, while the additional cost of coal, as compared with the figures of the corresponding half year, has been £92,154, the increase in the returns for residuals has been £110,091.

In consideration of the improved condition of the market for coke and other residuals, the Directors in October last resolved to reduce the price of gas to private consumers in their district north of the Thames by 1d. per 1000 cubic feet as from the 1st of January inst.

In common with all other large users of coal, the Company has experienced very great difficulty in obtaining the quantities of coal which had been purchased for delivery during the past half year, and this has resulted in a serious depletion of the stocks. Fortunately the quantity of coal purchased was in excess of the Company's immediate requirements; and it has not been necessary to restrict on any occasion the full supply of gas throughout the Company's district.

The present condition of the coal market is a cause of anxiety to the Directors, for, while they do not believe that the specially high prices which have been quoted during the past month or two fairly represent the market value, they cannot anticipate any extension of their existing contracts except at some advance on the current contract prices.

The Directors have deposited a Bill for raising, by 3 per cent. debenture stock, £2,500,000 additional capital to meet the expenditure necessary to provide for the extension of the Company's business. The provisions of the Bill are in all respects identical with those of the Bill which passed the House of Commons in May last. In compliance with Standing Orders, this Bill will be submitted to the proprietors, for their approval, at a special meeting to be held after the close of the ordinary meeting.

In August last, negotiations were commenced between the Directors of this Company and those of the South Metropolitan Gas Company for the sale to that Company of so much of this Company's undertaking as is comprised within its district south of the Thames. For the consideration of this question, a friendly conference between the Directors of the two Companies was subsequently held, and this was followed by correspondence; but up to the present time no agreement has been arrived at. The price offered on the part of the South Metropolitan Company was, in the opinion of the Directors and responsible officers of this Company, inadequate; while that asked on the part of this Company was held by the Directors of the South Metropolitan Company to be excessive. Under these circumstances, with a view to arriving at a settlement, the Directors of this Company proposed that the question of price should, within certain limits, be the subject of a reference to arbitration. But the Directors of the South Metropolitan Company have declined to entertain the idea of such a reference; and there the matter for the present rests. As, however, the South Metropolitan Company has deposited a Bill in which permissive powers are sought for the purchase of the southern portion of this Company's undertaking, there will doubtless be further opportunities for discussing the whole subject.

The Bill above referred to, and that deposited by the London County Council "for making further provision as to testing the illuminating power of gas" and for other purposes, will receive very careful watching on the part of the Directors, with a view to safeguarding the interests of the Company.

Mr. Chisholm and Mr. Stoneham, the Auditors of the Company, retire. Mr. Stoneham offers himself for re-election. Mr. Chisholm has notified that, on the ground of ill-health, he does not intend to seek re-election; and Mr. P. H. Ashworth and Mr. J. J. Walker, both being duly qualified for election, have respectively given notice of their intention to become candidates for the vacancy thus created.

The accounts accompanying the report consist of the usual statements. The total amount of capital authorized is: Share, £21,642,990; loan, £4,323,975—together, £25,966,965. Of this amount, £25,516,965 had been called up on the 31st of December, and the addition of £1,603,050 of premium capital made a total of £27,120,015. The expenditure on capital account in the past half year is shown in the following items:—

Expenditure to June 30, 1899			£12,749,020 14 11
Expenditure during the half year to Dec. 31, 1899, viz.:—			
Buildings and machinery in extension of works	£9865 14 1		
New and additional mains and service-pipes	22,877 5 0		
Do. do. meters	28,077 19 7		
Do. do. stoves	26,061 17 3		
	£86,882 15 11		
Cr. by sale of surplus land	11,048 7 1		
		75,834 8 10	
		£12,824,855 3 9	
Nominal amount added on conversion		13,656,465 0 0	
		£26,481,320 3 9	
Balance of capital account		638,694 16 3	
		£27,120,015 0 0	

The revenue and net revenue accounts are given below.

The balance applicable for division is £560,663 15s. 1d.; and the statement showing how the Directors propose to appropriate it is as follows:—

Dec., 1898.			
£51,855	..	Net balance brought from last account	£139,557 19 0
364,641	..	Net revenue for the half year	421,105 16 1
£416,496			£560,663 15 1
(12½ per cent.)		A dividend on the ordinary stock—	
£362,737	..	£4 18s. per cent. per annum on £14,993,075 . .	367,330 6 9
£53,759	..	Balance carried to next account	£193,333 8 4

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £51,224; insurance fund, £83,492; depreciation fund, £53,895. The insurance fund had to bear during the past half year a payment of £59 16s. 8d., the value of plant destroyed by fires in the Company's district.

The statements furnishing particulars as to working are as follows:—

STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 30th June, 1899.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 31st Dec., 1899.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . .	119,463	1,003,398	977,626	1,530	143,705
Cannel . .	18,686	4,844	*6,111	4	17,415
Total . .	138,149	1,008,242	983,737	1,534	161,120

* In addition to this quantity of cannel 4,498,100 gallons of oil and spirit have been used during the half year.

STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 30th June, 1899.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 31st Dec., 1899.
Coke—tons	25,191	612,760	138,942	463,478	35,531
Breeze—tons.	384	64,873	18,414	42,610	4,233
Tar—gallons	784,601	10,092,554	9,807,514	21,439	1,048,202
Ammoniacal liquor—butts	32,383	286,892	292,127	..	27,148

STATEMENT OF GAS MADE, SOLD, ETC.

Quantity Made.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lamps.
	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*11,424,876	549,952	10,214,092	10,920,463	52,522
†10,928,545	542,772	9,716,486	10,403,251	52,345

* Including 1,488,592,000 cubic feet of "oil gas." † December half year, 1898.

The last statement is the general balance-sheet. It shows that the value of the stores on hand on Dec. 31 was as follows: Coals, £114,013; coke, £24,329; tar and ammoniacal liquor and products, £112,418; sundries, £254,596—total, £505,356. The figures at the corresponding period of 1898 were: Coals, £163,174; coke, £17,125; tar, &c., £91,625; sundries, £263,979—total, £535,903. The item "automatic meter supplies (fittings account)" amounts to £289,604, as compared with £299,902 in the six months ending Dec. 31, 1898.

DR. REVENUE ACCOUNT. CR.

Dec. Half Year, 1898.		£ s. d.	£ s. d.	Dec. Half Year, 1898.		£ s. d.	£ s. d.
	To Manufacture of Gas—				By Sale of Gas—		
£634,037	Coals, including oil, dues, carriage, unloading and trimming	723,191 3 9		£1,439,043	Common gas, per meter, at 3s. and 2s. 1d. per 1000 cubic feet .	1,535,404 13 6	
14,471	Salaries of engineers and other officers at works	14,454 10 2		77,538	Public lighting and under contracts— Common gas	74,076 0 1	
161,274	Wages, carbonizing £161,684/15/5			£1,516,611			1,579,480 13 7
16,870	„ sundries . . £17,348/14/1	179,033 9 6		20,179	Rental of stoves	..	22,137 11 5
57,511	Purification, including £16,959/11/10 for labour.	35,183 19 10			Residual products—		
	Repair and maintenance of works and plant, materials and labour, less received for old materials,			£254,486	Coke, less £43,035 16s. 7d. for labour, &c.	321,181 14 2	
153,587	£3536 12s. 6d..	178,973 17 5		6,200	Breeze, less £2,237 4s. 10d. for ditto	9,007 13 6	
			1,133,843 0 8	43,151	Tar and tar products	68,885 5 1	
	Distribution of gas—				Ammoniacal liquor and sulphate		
	Salaries and wages of Officers			67,500	of ammonia	82,353 1 9	
32,095	(including Rental Clerks) . .	34,348 14 9		£371,337			481,427 14
	Repair and maintenance of mains						
46,819	and service-pipes	43,101 11 7		£4,442	Rents receivable		4,635 4 8
25,505	Repair and renewals of meters .	22,038 19 3		216	Transfer fees		238 17 6
28,685	Stove fixing, repairs, and renewals	30,525 18 9					
			131,015 4 4				
	Public lamps—						
17,348	Lighting and repairing	..	16,044 17 11				
	Rents, rates, and taxes—						
5,909	Rents payable	6,153 12 1					
110,397	Rates and taxes	118,229 13 11					
			124,383 6 0				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors and Assistant	252 10 0					
10,945	Salaries of Secretary, Accountant, and Clerks	10,945 17 0					
19,741	Collectors' commission	20,425 8 11					
7,668	Stationery and printing	6,964 5 5					
3,685	General charges	3,487 5 4					
			44,825 6 8				
702	Parliamentary charges	..	..				
1,056	Law charges	..	633 10 7				
4,907	Bad debts	..	5,431 12 0				
	Depreciation fund for works on lease-						
500	hold lands	..	500 0 0				
12,427	Annuities	..	12,932 0 11				
2,500	Workmen's Compensation Account .	..	2,045 12 4				
	Public Officers—						
1,254	Gas Referees and Official Auditor.	1,433 9 4					
856	Public testing-stations	1,241 13 5					
			2,680 2 9				
£1,352,589			1,473,334 14 2				
560,196	Balance carried to net revenue account		614,885 7 6				
£1,912,785			2,088,220 1 8	£1,912,785			2,088,220 1 8

DR. NET REVENUE ACCOUNT. CR.

Dec. Half Year, 1898.		£ s. d.	£ s. d.	Dec. Half Year, 1898.		£ s. d.	£ s. d.
£64,160	To Interest on debenture stock and bonds, accrued to Dec. 31, 1899 . .	..	66,429 12 6	£414,592	By Balance from last account	506,888 5 9	
75,999	Dividend on the preference stocks. .	75,999 4 0			Less dividend on the ordinary capital		
45,500	Dividend on the 3½ per cent. maximum stock	45,500 0 0		362,737	for the half year to June 30, 1899 .	367,330 6 9	
			121,499 4 0	51,855			139,557 19 0
9,896	Interest on temporary loans & sundry funds		5,870 14 11	530,196	Revenue account	..	614,885 7
416,496	Balance applicable to dividend on the ordinary stock.		666,663 15 1				
£612,051			754,443 6 6	£612,051			£754,443 6 6

The Projected Purchase of the Newtown Gas-Works by the District Council.—Yesterday week a town's meeting was held at Newtown (Montgomeryshire), to consider a resolution approving of the propriety of the promotion of a Bill in Parliament to empower the Council to supply gas, and to purchase the undertaking of the Newtown and Llanllwchaiarn Gas and Coke Company, Limited, and for other purposes. One of the ratepayers moved that the Council take no action at present, and referred to the proceedings of the Council in relation to the purchase of the water-works. Since the purchase of the gas-works had been before the Council, matters had seriously changed for the worse in his opinion, and he doubted if the ratepayers generally were in favour of further proceeding with the Bill. Eventually, however, the resolution approving of the Bill was carried; three members only voting against it.

Pudsey Gas Company.—The Directors of this Company report the satisfactory increase of 8 per cent. in the consumption of gas during last year. An interim dividend was paid at the rate of 8¾ per cent. per annum on the new consolidated 7 per cent. stock; and a similar dividend for the past half year is recommended. During the twelve months, above 121 million cubic feet of gas was sold; and the income was £20,208.

The Foulger-Glover Torch Syndicate, Limited, has been formed with a capital of £5000, in £10 shares, to acquire certain inventions specified in an agreement made with Mr. G. F. L. Foulger and Mr. J. Glover relating to improvements connected with the lighting of incandescent and other lamps. The first Directors are Messrs. R. T. Glover, J. G. Glover, G. F. L. Foulger, and W. Sugg. Mr. Foulger and Mr. Glover are Managing-Directors.

RATES AND GAS AND WATER CHARGES IN PROVINCIAL TOWNS.

Mr. James Carter, Borough Treasurer of Preston, and Hon. Secretary of the Association of Borough Accountants, has sent us a copy of his tabulated statistics of the rates levied and the charges made for gas and water in a number of provincial towns. There are 71 in all, the populations in which range from 668,645 (Liverpool) down to 21,937 (Stafford); the rateable values in these towns being the highest and the lowest—£3,910,369 and £73,007. The places with the highest rates are Dewsbury, 8s. 6d.; Middlesbrough and Norwich, 8s. 5d.; and West Ham, 8s. 2d. Belfast and Rotherham come next with 7s. 9d.; Sheffield with 7s. 8¼d.; Wolverhampton with 7s. 8d.; Brighouse and Stockton-on-Tees with 7s. 5d.; East Ham and Preston with 7s. 4d.; Northampton with 7s. 3¾d.; Leicester and Southampton with 7s. 3d.; Macclesfield with 7s. 2d.; Stafford with 7s. 1d.; Nottingham with 7s. 0½d.; and Coventry, Leeds, Oldham, and Plymouth with 7s. The rates in 22 places range between 6s. and 7s. in the pound; and in 26, between 4s. and 6s. The lowest-rated place is Lancaster, with 3s. 8d. in the pound. Out of the rents of property and profits transferred from municipal undertakings, Carlisle relieves the rates to the extent of 2s. in the pound; Wigan coming next with 1s. 10d.; Darlington with 1s. 7½d.; Stafford with 1s. 4¾d.; Stockport with 1s. 3½d.; Blackpool with 1s. 1d.; and Lancaster with 1s. The following places receive the smallest relief per pound from the municipal profits: Accrington, 1·8d.; Dewsbury, 1·75d.; Eastbourne, 1·375d.; Blackburn, 1·25d.; West Hartlepool, 1·125d.; St. Helens, 1d.; Portsmouth, ½d.; and Sunderland, 0·4d. The highest net charge for gas is at Preston—3s. 1¼d. per 1000 cubic feet—where the total rates amount to 7s. 4d. in the pound; and there is relief to the extent of 8d. The lowest is at Carlisle—1s. 3d per 1000 cubic feet—where the rates are 5s. in the pound; the relief from the municipal undertakings (including the gas and water works) being 2s. in the pound. Besides Carlisle, there are only six places in the list where the price of gas is below 2s.—viz., Sunderland and York, 1s. 11d.; Sheffield, 1s. 10d.; Newcastle and Gateshead, 1s. 9·6d.; and Plymouth, 1s. 9d. The supply in these cases is in the hands of Companies. The charge for water for domestic purposes, on a house of £15 rateable value, is highest at Rochdale—2s. in the pound, where the rates come to 6s. 8d. in the pound, and the relief is 8½d. Here there is a deficiency of 1½d. in the pound on the water-works. The price is lowest at Liverpool—7½d.; Leamington and Manchester following closely with 8d., Reading with 10·8d., Bootle with 10·5d., South Shields with 10·4d., and Birkenhead, Salford, and Southampton with 10d. Besides Rochdale, there are only five places where the charge is above 1s. 6d. in the pound—viz., at Ashton-under-Lyne, 1s. 11d.; Blackburn, 1s. 7·2d.; Chester, 1s. 8d.; Darwen, 1s. 7·2d.; and Huddersfield, 1s. 8d.

LARGE GAS-WORKS EXTENSIONS AT BLACKPOOL.

Local Government Board Inquiry.

Some considerable extensions at the Blackpool Gas-Works have been projected; and an application having been made to the Local Government Board for sanction to borrow £86,020 for the purpose, an inquiry into the matter was held last Wednesday. The Town Clerk (Mr. T. Loftus), in stating the case for the Corporation, mentioned that the proposal was to practically duplicate the present works. In 1894, the capital of the undertaking was £98,739; now it was £144,000. In 1894, 245,000,000 cubic feet of gas was made, and last year 427,000,000 cubic feet. In the first year the department handed over to the relief of the rates £5229, and last year £10,700. The rateable value had increased from £220,175 to £387,600. Mr. John Chew, the Gas Engineer, detailed the plans; the works being erected on the east side of the railway. It was proposed to spend £10,000 upon carburetted water-gas plant. Questioned by Mr. Tomlinson, a member of the Town Council, Mr. Chew said there was a great deal of difference of opinion as to the use of carburetted water gas. Addressing the Inspector, Mr. Tomlinson favoured the greater use of carburetted water gas. Though only 25 per cent. was about the proportion used in this country, 75 per cent. was allowed in America. Where the works were proposed to be built, there was a very large population, who were anxious as to any nuisance that might arise from the works. Some members of the Council, he said, were favourable to the gas-works being removed to an entirely new site. Mr. Chew said to do this would mean a loss of £100,000, and the raising of the price of gas 6d. per 1000 cubic feet. There was no opposition.

THE AUXILIARY GAS-WORKS FOR COVENTRY.

Arbitration as to the Purchase of Land.

Last Thursday, at St. Mary's Hall, Coventry, Sir John Rolleston, of Leicester, sat as Umpire in a dispute between the Corporation Gas Committee and the Coventry General Charities Trustees, as to the price to be paid for land at Foleshill, which, under statutory powers, the Corporation desire to acquire for the purposes of auxiliary gas-works. The area of the land is about 26 acres. Mr. H. Yorke Stanger, Q.C., and Mr. P. Atkin represented the Corporation, and Mr. Hammond Chambers, Q.C., the Trustees. Mr. Chambers contended that the land was especially valuable, as it had on one side the main road from Coventry to Nuneaton, was near the canal and railway, and was passed by an electric tram service. It was well adapted for the erection of artisans' dwellings, factories, and workshops, and was now let to a yearly tenant at £45—a rate which must very quickly increase. He placed the value at £5500. Mr. W. P. Evans, Agent to the Newdigate Estates, thought that, including the percentage added for compulsory purchase, and considering there was coal underneath the land, it was worth £5559. Mr. Stanger strove in cross-examination to prove that a previous offer of the Trustees was very much less than the value now placed by them on the land. Mr. Chambers remarked that the previous offer was made without prejudice, and had been withdrawn. Mr. Stanger urged that, according to the geological survey, no coal was under the land. Mr. Joseph Ashley, auctioneer, considered that, exclusive of 10 per cent. for compulsory purchase, the land was worth £5086. Mr. T. Clements, auctioneer, made his estimate £5525, and believed, if the Trustees waited their opportunity, they would obtain even more than that. Mr. Stanger held that the valuation put upon the land was a speculative and excessive one when the rental was but £40 or £45 per annum. From £1500 to £1700 was the value which his witnesses placed upon it. Mr. T. S. Fallows, auctioneer and valuer, Birmingham, estimated the value at about £1600. It was purely agricultural land, and not suitable for building purposes. He placed no value on the belief that there was coal under the land. Mr. W. F. Pudmore, estate agent, considered the value to be about £1685, and Mr. W. J. Watson, auctioneer, placed it at £1750. Addresses by Counsel concluded the inquiry.

HARTLEPOOL GAS AND WATER COMPANY.

Consolidation and Increase of the Capital—Sale of Shares.

A Special Meeting of the shareholders of the Hartlepool Gas and Water Company was held last Thursday, to consider the provisions of the proposed Bill for the consolidation and conversion of the existing capital, and for raising additional gas capital of £200,000. The Chairman (Mr. W. H. Fisher) said it was proposed that the various classes of shares should be consolidated and converted into uniform stock, bearing interest at the rate of 5 per cent., in such a way that the shareholders would remain in relatively the same position as before. Thus a total capital of £480,000 in four different classes of shares bearing interest at 5, 7, 7½, and 10 per cent. would become £699,000 of uniform 5 per cent. stock. The Directors also asked for power to raise additional gas capital because they had nearly exhausted the amount at present authorized. They had but 1000 shares unsold, and 500 of these had only just been disposed of by auction, and the other 500 would be offered shortly. The sum thus raised would just about pay for the works they had in hand at the present time for making carburetted water gas. But if the present rate of increase went on, they would have to tackle a much greater expenditure for a second coal-gas works on the new site. Last year there was an increase on the previous twelve months of 44 million cubic feet of gas consumed; and during the first half of the present financial year, there had been a further increase of 11 million cubic feet. The provisions of the Bill were then read and explained; and by a unanimous vote they were approved.

At the sale of the 500 £10 shares referred to by the Chairman, the prices realized varied between £17 17s. 6d. and £18 3s. 6d.

GAS MATTERS AT MIDDLESBROUGH.

It may be remembered that some months since, the Middlesbrough Corporation Gas Committee asked the Council to sanction an increase in the price of gas. The reason given was that the advance in the price of coal and other materials necessitated an increase in the price of gas, in order to make the income equal the expenditure. At the time several members of the Council thought it would be better to put on 6d. instead of 3d. per 1000 cubic feet; and (according to the "Northern Echo") at the meeting of the Gas Committee last Wednesday it is understood a report was submitted by Mr. Corbet Woodall, the Consulting Engineer for the extensions taking place at the gas-works, that suggests even 6d. increase would be inadequate. Mr. Woodall, it is said, practically condemns the large gasholder tank on the Marshes, concerning which so much discussion has raged for several years. Unfortunately the position is precarious, because of the deficiency of gasholder storage. The daily output is about 2½ million cubic feet; and the reliable holder can only contain 1 million cubic feet. Mr. Woodall therefore urges the Committee to proceed at once with the erection of another gasholder, incorporating a part of the present one. As an alternative, he suggests building a small one for safety; and then taking down the large tank and re-erecting it after consolidating the foundations. As it will take two years to erect a new tank, it seems obvious that no time should be wasted; and as a matter of fact, the Committee instructed the Manager (Mr. David Terrace) to report further on the matter. Mr. Woodall also describes the system of mains as defective, particularly with regard to the maintenance of an equal illuminating power; and he makes various suggestions, which he believes would have the effect of improving the supply along the riverside and in the busiest parts of the town. This, of course, means additional expense. The Committee, says our contemporary, ought to renew mains and service pipes perhaps more frequently than is done in other towns; for Middlesbrough lying so low and level there are many places where the soil being saturated renders the life of the pipes so much shorter. The Engineer also thinks the lighting of the streets compares unfavourably with other towns, and would like to suggest that the use of incandescent lights would prove successful, and not cost any more. The report, as a whole, seems to point to considerable further expenditure on the gas undertaking; and the impression is that the past has not altogether borne its fair share of the burden.

THE RETORT-HOUSE DISASTER AT STOKE.

Inquest on the Second Victim.

On Monday of last week, Mr. Hugh W. Adams, the Deputy-Coroner, held an inquiry, at the North Staffordshire Infirmary, into the circumstances attending the death of James Wheatley, a bricklayer, who had succumbed to the injuries received in the accident which occurred at the Stoke-on-Trent Corporation Gas-Works on the 10th inst. The evidence was practically the same as that given at the inquest on the body of Plumb, who it will be remembered was killed instantly, and in whose case the Jury returned a verdict of "Accidental death" (see *ante*, p. 156). In the course of the evidence last Monday, it was stated that the new retort-house was being erected under the direction of John A. Garside, a foreman in the employ of Messrs. R. Dempster and Sons, Limited, and a man of considerable experience. The walls were up, and

seven principals were in position. About noon on the 10th inst., a sudden gust of wind came; and the principals fell towards the south side of the building. By this collapse Plumb was killed, and the deceased and several other men sustained serious injuries; these proving fatal on the 18th inst. in the case of Wheatley. Ephraim Heath, foreman bricklayer, in the employ of Mr. Embrey, stated that the walls of the new retort-house had been up about two weeks before the principals were put on. He did not think the mortar had properly set, because the weather had been so bad. At the same time he did not think the walls had given way. He had had experience in this kind of work; and, in his opinion, the principals were not secured properly, or the accident would not have happened. He thought it was quite possible for the gust of wind to blow the principals over. There were no diagonal strappings fixed. In his evidence at the other inquest, and confirmed by him at this, Garside said that at the foot of each principal two holes were introduced for bolting; but he had not considered the bolts necessary in this case. The Jury came to the unanimous decision that the accident was brought about by negligence on the part of the erector in not properly fixing the girders. They thought that none of the girders should have been put up until properly bolted. The Coroner: There are different degrees of negligence. The Foreman: We think the foreman was to blame in putting up the girders without staying them. In further reply to the Coroner, he said the Jury did not think it was a case of gross negligence; and their verdict was one of "Accidental death." The Coroner intimated that he would add to this the Jury's expression of opinion.

In the minutes adopted at the meeting of the Stoke Town Council last Thursday was an expression of the sympathy of the Gas Committee with the widows and relatives of Peter Plumb and James Wheatley.

EXPLOSION AT THE NEWARK (N.J.) GAS-WORKS.

A Meter-House Wrecked.

A correspondent sends an account of a somewhat serious explosion that occurred during the evening of Tuesday, the 9th inst., at the gas-works at Newark (N.J.), U.S.A. The meter, purifying, and condensing house was torn to atoms; the windows in houses and stores for blocks were broken; and the alarm created spread to all parts of the city. What caused the explosion is not known, as there was no one in the building at the time. The structure was of brick, 100 feet long, 60 feet wide, and about 60 feet high, but had only one floor. It formed an L with the main building and ran along the Morris Canal from Congress Street. The building was visited about once an hour to inspect the working of the automatic machinery and appliances in it; but no one had been in it for upwards of three-quarters of an hour before the explosion took place. In the main building and retort-house adjoining many men were at work. The explosion threw the south wall of the building into the canal, filling it with brick rubbish. The roof flew upward and outward, and landed some distance from the site of the building. The explosion was followed by a flash of flame so brilliant that it was seen from every engine-house in the section; and before an alarm had been turned on the firemen were on their way to the scene, guided by the glare. The prompt arrival of the firemen kept the flames from spreading; but the burning gas gave the firemen much trouble, and they had an all-night job. A peculiar feature of the explosion was that while the walls and roof of the building were wrecked, the force does not appear to have worked inward; and although covered with *débris* most of the apparatus in the building continued to perform its duty, and only a few sections of the city were left without gas. This leads to the belief that one of the meters blew up and wrecked a few other pieces of machinery in the building, together with the structure itself, but left the rest of the machinery intact. The loss to the Company will be about $20,000; and the damage to buildings in the neighbourhood, $5000.

Our correspondent adds: How the escaping gas was ignited is a mystery, as there were no open lights in the room. The place was lighted from lanterns in the walls. It is thought, however, that the glass in one of the lanterns must have been cracked. Or the leak may have come from a broken gauge glass. In his own works the glasses occasionally break; and so, as a precaution, he has the cocks to the gauges always turned off at night.

SINGULAR GAS POISONING CASE AT WEDNESBURY.

Two Ladies Suffocated—A Doctor's Testimony.

News of a distressing case of gas poisoning comes from Wood Green, Wednesbury. In this instance, the lives of two ladies were lost—Isabella Francis (aged 82) and Monica Minnie Tuthill (aged 19), respectively mother-in-law and daughter of the Rev. R. G. Tuthill, Vicar of Wood Green. The two ladies resided at the vicarage, and occupied the same bedroom. They retired to rest about 10.30 on the night of Friday, the 19th inst.; and as they did not appear by breakfast time the following morning, a sister of the younger lady went to their room for the purpose of calling them. Receiving no response, she raised an alarm; and deceased were then discovered to be dead. The gas-jet in the room was found alight, and there was a strong smell of gas. At the inquest held by the District Coroner (Mr. H. A. Pearson) on Monday last week, Dr. Walter Garman (whose evidence was of an interesting character) stated that he was called to the vicarage before ten o'clock on Saturday morning, and found Mrs. Francis and Miss Tuthill both dead. The room smelt strongly of gas when he arrived, although he understood the door had been open about forty minutes. He was of opinion that Miss Tuthill had died quite recently; but Mrs. Francis appeared to have been dead longer. The peaceful expression and attitude of both the deceased were such as to show that they had died painlessly and in their sleep. In his opinion, death was due to asphyxia, slowly produced by prolonged breathing of gas-laden air. Deceased would be almost imperceptibly poisoned. In answer to the Jury, witness said death was due to ordinary coal gas. The carbon monoxide had displaced the oxygen, and had thus produced death. There was nothing improbable in gas being present while there was a faint glimmer of light in the room. He agreed that there might easily have been an explosion, but the explosive mixture of air and gas was a peculiar one, and required a definite proportion of coal gas before the explosion point was reached. The air might be highly charged with gas, and quite capable of destroying life, without reaching a point when it would ignite; and this had been the case here. Witness had followed this point up carefully, and found there would be some diffusion going on, as there was a passage up the chimney. The escape of gas might have been, and apparently was, slow; and the diffusion which went on was sufficient to prevent it ever reaching the explosion point. Another matter which had struck witness was that there was a thick carpet all over the bedroom floor except under the bed; and if the gas escaped underneath the boards and found itself shut in by a thick carpet, it would probably travel to the bed, where there was no carpet, and the occupants of the bed would have the gas thick about them, while it would diffuse into the air elsewhere. He thought this appeared to exactly account for the way in which death occurred in the present instance. He could not express an opinion as to whether, had the bedroom door been left open, the effect of the gas would have been nullified; but a very little more oxygen only was needed in the room to have warded off death sufficiently long to have enabled some means to be taken to restore animation. It was a rate of poisoning which required eleven hours to do its work. Witness understood there had been difficulties experienced with the gas; and it was possible that a syphon had been left turned on. Eliza Price, housekeeper at the vicarage, stated that on Friday night the gas-lights all suddenly went out; and witness attended to the meter by putting water in it. Miss Monica and a sister turned off all the jets, and afterwards relighted them. There was a gas-syphon underneath the boards in the room which deceased occupied; and she thought the younger woman might have been attending to this. A police-superintendent stated that he went to the vicarage about 10.30 on Saturday morning, and observed there was a strong, though not an overpowering, smell of gas in the bedroom in question. In a far corner of the room, he saw a loose board, underneath which was the syphon referred to. On kneeling down, he came to the conclusion that gas was oozing out from this loose board. The syphon was turned off; and, having satisfied himself that there was no volume of gas, he struck a light, with which he examined the joints, but could detect no leakage. James Tidey, gas-fitter, spoke to examining the gas-pipes, and to finding no leakage whatever. He tested the meter for two hours, and obtained conclusive proof that all joints and taps were sound. The Jury returned a verdict of "Accidentally suffocated." But the point from which the gas actually leaked remains a mystery.

ELECTRIC LIGHTING NOTES.

On Friday Mr. W. A. Ducat conducted a Local Government Board inquiry at Birkenhead into an application by the Corporation for power to borrow £3500 for the purpose of extending the electric light to various roads in Higher Tranmere. There was no opposition.

Under the heading of "The Spasmodic Illumination of the Streets," a letter appears in one of the Plymouth newspapers complaining of the eccentricities of the arc lamps. "The remedy is simple enough," says the writer; but this hardly seems to be the case, for the complaints have now continued for four months, and the town, according to the writer of the letter, is still in semi-darkness.

At a meeting of the Parliamentary and Bye-Laws Committee of the Newcastle Corporation last Tuesday, reference was made to an application to Parliament from an Electric Lighting Company for power to supply electric light at Whickham and other places in the district. As it was considered that the promoters would also seek powers to carry their lines through the streets of the city, it was decided to take steps to oppose the application. There was a feeling that the Corporation would, in time, be able to supply such places themselves.

The Electrical Engineer of Belfast (Mr. V. A. H. M'Cowen) has submitted to the Corporation Electric Lighting Committee his annual report It disclosed the interesting fact that the increase in the number of units sold during the past year was 76 per cent.; while the increase in revenue was only 1 per cent.—thus indicating a considerable reduction in the charge for current. The average price for current for lighting during the year was 4½d. per unit, and for power purposes 2⅜d. per unit. The number of lamps applied for and connected up amounts to above 58,000.

"Industries and Iron," referring to the recent failures of the electric light in Marylebone and elsewhere in London, says: "The County Council has power to require that the Gas Companies shall maintain their light at a certain standard; and frequent official tests are made to secure that end. Something of the same kind is becoming necessary with regard to the Local Authorities and Companies now professing responsibility with regard to electric lighting. They should be required to bring their plant to such a point that it can deal with the maximum demand that is likely to occur."

The "Municipal Journal" considers that until the Electric Lighting Companies bring down their charges, they are not going to make much advance in public street lighting in those districts of London where they have already secured a foothold. In Kensington, the Vestry have been considering for some time whether to allow the two Companies within their area to light some of the main roads. Although the price to be charged for public lighting has been provisionally fixed by Parliament at not more than 2½d. per unit, the Vestry regard this figure as being still too high. Until more favourable terms can be obtained, the Vestry are being urged by their Works Committee "to look for the improvement of the street lighting in the parish to the increased adoption of incandescent gas lighting."

Under the heading of "The Light that Failed," the "Municipal Journal" has an article on the recent interruptions of the electric lighting in Marylebone and Paddington. It is only in these two parishes that the Metropolitan Electric Supply Company have an absolute monopoly; but our contemporary remarks that "there has been sufficient inconvenience in them to suffice for the whole of London." The following particulars are given of the failures last December in the drapery establishment of Messrs. Lewis and Co., in Oxford Street and Hollis Street: Dec. 6, 4.40 to 7.50 p.m.; Dec. 7, 4.45 to 5.15 p.m.; Dec. 8, 5.20 to 7.30 p.m.; Dec. 11-14, 4.0 to 8.0 p.m.; Dec. 15, 3.0 to 4.0 p.m. The

cause of the interruptions on the 6th and 7th is given as "main fuse;" "no current" being entered against the other dates.

Mr. J. H. Rider, the Engineer of the Plymouth Corporation electric lighting works, has been kind enough to warn the consumers that they will have to pay for the luxury in which some of them have been indulging freely during the last quarter. The accounts for this period are about to be sent out, and he is of opinion that they will frighten a good many people. But the fright will, he thinks, do them good. When they have had a heavy bill, they will learn to be economical in the use of the light, and will turn the current off when it is not required. To people who have been accustomed for years to the unstinted use of cheap gas, the turning of the lights on and off will be a new experience; while to tradesmen who have the electric light in their shops and windows, the lesson—sharp as Mr. Rider says it will prove—will be of no avail. They must keep the lights on during the lighting-up time in business hours.

For the purposes of the electric lighting undertaking, the St. Helens Town Council require an additional £20,000; and Mr. A. W. Ducat, of the Local Government Board, last Thursday inquired into an application for leave to borrow this sum. The Town Clerk (Mr. G. W. Bailey), in sketching the history of the concern, said the Council first undertook electric lighting in 1896; and on April 24 in that year obtained sanction to borrow £10,000 for putting down experimental plant on the alternating-current system at the gas-works in Warrington Old Road. On Oct. 16, 1897, a further £16,500 was sanctioned; but only about £4000 of that sum was expended at Warrington Road, when it was decided to change from the original scheme, and erect an electricity station at Cropper's Hill, in order to supply current on the continuous system for both lighting and traction purposes. In connection with this project, they had spent £2956 more than the sums borrowed; and they desired a further sum—£17,043—for extensions of the station and plant. Since the Corporation adopted electricity, the business had rapidly developed. In 1896 they started with 15 consumers and 1686 lamps; and in December last year they had 150 consumers and 10,612 lamps. Mr. J. S. Highfield, the Corporation Electrical Engineer, detailed the proposals as to extensions.

The administration of the Bath Corporation electric lighting works must be in a bad way if the severe criticism which Mr. W. F. Gould passed on it at the last meeting of the Town Council has a good foundation. He compared an analysis of their returns for the year 1898 with the returns of other corporations, showing that the cost and quantity of coal used was excessive; that in oil, waste, &c., the expenses were only exceeded in one other town (Coventry); that the works costs were higher than any in London, and were only exceeded by five other towns; that every unit burnt in the public lamps meant a loss; and that the item for management, salaries, legal expenses, and insurance was only exceeded in four other places. He thought careful inquiry should be made with a view to reducing the expenditure, and moved, as an amendment to the adoption of the Committee's minutes, that the Chairman be asked to appoint a small Committee to deal with this matter. The amendment, however, was ruled out of order by the Mayor. Alderman Taylor, replying, pointed out that in 1898 the electric light works were in a transitory state; and the expenses were necessarily heavy. The report for 1899 would be brought forward as soon as possible; and he asked the Council to wait for it before appointing a Committee of Inquiry.

The commotion of the past year or two at Walker over the electric lighting question has not been altogether calmed by the bestowal of powers of supply on the District Council in preference to the Gas Company; for now that the former are proposing to exercise their newly acquired authority, a formidable opposition has arisen against them doing so. This was made amply clear by the proceedings at an inquiry conducted by Lieut.-Col. A. C. Smith, on behalf of the Local Government Board, in respect to an application by the Council for permission to borrow £28,356 for an electric lighting and dust destruction scheme. The Clerk (Mr. T. M. Sturgess) laid before the Inspector an account of the contests which the Council have had during past years to keep in their own hands the right to furnish electricity in the town. He then pithily described the objects of the comprehensive scheme which the Council purpose undertaking as being (1) to efficiently deal with the refuse; (2) to supply electricity to private consumers; (3) to supply cheap power to various manufactories; and (4) to provide a complete system for the public lighting by means of electricity, at a cost no higher, and probably less, than that at present paid to the Gas Company. The proposals of the Council could not have been put more nicely; but, notwithstanding, when the Inspector asked if there was any opposition, quite a string of gentlemen representing important interests popped up. Mr. George Irving opposed on behalf of the North-Eastern Railway Company, who are large ratepayers. Mr. Samuel Alexander and Mr. Wigham Richardson appeared in opposition, as did also Mr. John Brown, who presented a petition, which he said had been got up hurriedly, from the ratepayers in the district. He had not had one refusal to sign it; and he was certain that 90 per cent. of the property owners were against the scheme. Mr. Henry White was present to oppose on behalf of the owners of the Walker Colliery, and Mr. R. S. White for Messrs. Sir W. G. Armstrong, Whitworth, and Co. They made out a substantial case in support of their opposition.

On Tuesday last, there was a conference at the Manchester Town Hall of representatives of the Municipal Corporations affected by the Lancashire Electric Power Bill. The Lord Mayor of Manchester (Mr. Thomas Briggs) presided; and nearly every corporate borough in the county south of the Ribble was represented, as well as Preston. The leading part in the speech-making was taken by Alderman Higginbottom, Chairman of the Electric Light Committee of the Manchester Corporation. He said the Bill had undergone some alteration since last year; but it was equally objectionable. As far as Manchester was concerned, the Corporation had instructed the Committee to oppose at every stage. Under clause 5, the promoters sought to put away what had been granted to corporations by Act of Parliament; and for this clause alone the Bill ought to be opposed. Under clauses 35 and 36, the promoters said that, with the exception of a main distributing-feeder which they wanted to carry through a borough, they did not propose to supply any consumer in such borough without the consent of the corporation. They held that they ought not to have a private Company running mains at a high voltage through their streets. In Manchester, claims were made against the Corporation in cases where they had any short circuits or explosions. Supposing a private Company had a main running through the streets with a pressure of 10,000 volts (from which the Corporation obtained no benefit whatever), if they had a short circuit or a blow-up, who was to decide whether it was in the Corporation's or the Company's main? Clauses 41 and 42 were alarming when looked into. It was quite plain from them that, if the Company's main ran down a street where there was a public building, and the "person or company" owning such building wished to be supplied from the main, the Company could take a supply into the building without cutting through the street. Corporations had been granted powers by Parliament; and had in many cases expended very large sums of money belonging to the citizens. Neither they who had exercised their powers, nor those who at present held those powers in abeyance, ought to be submitted to the opposition of private firms. The Bill said a corporation might supply in opposition to the Company; but what chance would a corporation have of so doing after the Company had become established? Parliament had hedged the powers of corporations round about with very stringent regulations; and they ought to be protected against interference from private companies. The Association of Municipal Corporations were going to fight three other Bills besides the Lancashire one—those affecting Tyneside, South Wales, and Dublin; and he hoped they would have the same success with regard to them as they had in their opposition to the Electrical Bills of last year. He moved—"That this conference of Municipal Corporations within the area comprised in the Lancashire Electric Power Bill, protests against the same as contravening the principle for which municipal corporations have in past years successfully contended, and which have been established by the Tramways Act, 1870, and the Electric Lighting Acts of 1882 and 1888, and determine to take united action in opposition to the Bill." The Mayor of Wigan (Mr. J. T. Gee) seconded the motion, which was carried unanimously. It was agreed that copies of the resolution be forwarded to the Prime Minister, the First Lord of the Treasury, the President and Secretary of the Board of Trade, to all the Lancashire members of Parliament, to all the Municipal Corporations of the United Kingdom, and to the Secretaries of the Associations of Municipal Corporations and of Urban District and Rural Councils. An Executive Committee were also appointed for the purpose of giving effect to the resolution, with power to apportion the expenses among the various Corporations comprised in the conference. The Executive Committee were also authorized to consider the provisions of similar Bills on this subject affecting other parts of the kingdom, and to take part in conferences which may be held in reference to any Electricity Bills promoted in Parliament in the present session. The Lord Mayor of Manchester was appointed Convener of the Committee.

THE FINAL REPORT OF THE METROPOLITAN WATER COMMISSION.

As recorded in the "JOURNAL" last week, the final report of the Royal Commission on "Water Supply within the Limits of the Metropolitan Water Companies" was published on the 22nd inst. We have already given an epitome of its contents, and the portion containing the principal recommendation of the Commissioners. In the present and succeeding issues we shall give a full abstract of the report.

The Commission was appointed by the Home Secretary (Sir Matthew White Ridley) on May 1, 1897; the Commissioners being Viscount Llandaff, the Right Hon. J. W. Mellor, Sir J. E. Dorington, Sir G. Barclay Bruce, Mr. A. de Bock Porter, C.B., Major-General A. de Courcy Scott, R.E., Mr. H. W. Cripps, Q.C., and Mr. R. Lewis. They were to inquire—

1.—Whether, having regard to financial considerations and to present and prospective requirements as regards water supply in the districts within the limits of supply of the Metropolitan Water Companies, it is desirable in the interests of the ratepayers and water consumers in those districts, that the undertakings of the Water Companies should be acquired and managed either (*a*) by one authority, or (*b*) by several authorities; and, if so, what should be such authority or authorities. To what extent physical severance of the works and other property and sources of supply of the several Companies, and the division thereof between different local authorities within the limits of supply, are practicable and desirable; and what are the legal powers necessary to give effect to any such arrangements.

2.—If the undertakings are not so acquired, whether additional powers of control should be exercised by local or other authorities; and, if so, what those powers should be.

3.—Whether it is practicable to connect any two or more of the different systems of supply now administered by the eight Metropolitan Companies; and, if so, by whom, and in what proportion, should the cost of connecting them be borne, and what are the legal powers necessary to give effect to any such arrangement.

Viscount Llandaff accepted the position of Chairman of the Commission; and the first meeting took place on May 29, 1897. The public sittings were held for the most part weekly, with intervals, until March 23, 1899, when the inquiry closed, and the Commission proceeded to consider their final report—they having, in compliance with a request from the President of the Local Government Board, issued on the 19th of January last year an interim report dealing with the third subject of the reference.

After the inquiry had closed, the Commissioners had the misfortune to lose two of their colleagues—Mr. H. W. Cripps and Major-General Scott—by death. The latter, however, was able to supply them with a full statement of his views on the subject of the inquiry; and they largely availed themselves of the valuable assistance thus afforded. The report, therefore, only bears the signatures of Viscount Llandaff, Mr. Mellor, Sir J. E. Dorington, Sir G. B. Bruce, Mr. A. de Bock Porter, and Mr. R. Lewis; but its recommendations may be taken as those of the entire Commission.

At their first meeting, the Commission considered the question of the manner in which their proceedings should be conducted. They decided that their sittings for the reception of evidence should be open to the public and to the Press, and that the parties concerned in the inquiry should not be represented by Counsel. Upon the latter decision becoming known, however, they received pressing applications, both from the

Metropolitan Water Companies and the London County Council, to reverse their ruling in this respect; and they modified their decision to the extent that Counsel were allowed to appear, on the understanding that they should only examine witnesses, or address the Commissioners on any points deemed desirable. The Commissioners immediately placed themselves in communication with, and invited evidence from, the Water Companies, the County Council, the Corporation of London, and the County Councils of Middlesex, Surrey, Kent, Essex, and Hertfordshire; these being the Authorities, within the area of Water London, primarily affected. They also afforded an opportunity to the Vestries and District Boards of Works within the County of London of either giving evidence orally, or of expressing their opinions in writing. Out of a total of 42 Authorities communicated with, 28 replied. The Commission first heard the views of the London County Council, then those of the City Corporation. Having completed the evidence of the Authorities within the County of London, the Commission proceeded to hear that of the five surrounding counties whose areas are partially within Water London. All the Urban and Rural District Councils whose areas were in any way affected were communicated with; but these Authorities, however, in the majority of cases, decided to leave their interests in the hands of their County Councils. The Commission next proceeded to hear the evidence called on behalf of the Water Companies. During the course of their inquiry, they found it necessary to make several applications to the Companies for information as to their supply and works. These requests, the Commissioners say, were "very readily complied with;" and they received from the Companies all the information they desired to obtain. They examined the Chairman and officials of each Company, with the exception of the Chairman of the Lambeth Company, and also (at great length) Mr. R. E. Middleton, one of the Engineers of the Staines Reservoirs Scheme, as well as the following Engineers: Mr. Walter Hunter, Sir Frederick Bramwell, Mr. Charles Hawksley, and Mr. E. M. Eaton. Sir William Crookes and Professor Dewar, who daily analyze and bacterially test the water supplied by the Companies, likewise gave evidence. The late Sir Edward Frankland, Mr. Allen Stoneham (the Government Auditor), the Chairman and Engineer of the Thames Conservancy, and the Clerk to the Lea Conservancy Board, were also called.

The Commissioners met on 84 days, 64 of which were occupied in hearing evidence; the number of witnesses examined being 79.

After these explanatory statements, the Commissioners offer some preliminary observations on certain considerations of great weight on the subject of the purchase of the London water undertakings, which appeared to them to be excluded from their inquiry. They point out that the Duke of Richmond's Commission in 1869 expressed the opinion that the control of the water supply of London and the expenditure of rates should not be in the hands of a trading company, but that, on various grounds of public policy, the supply should be under public control, and entrusted to a responsible public body. It was urged upon the Commission that Parliament had made a clear pronouncement in favour of the policy of purchase by the decisions of various Committees, by the numerous cases in which corporations had been empowered to purchase local water undertakings, and by legislation—such as the Chamberlain's sinking-fund clauses, which expressly contemplate purchase of the London Companies' undertakings. It was said that there was a popular demand and sentiment for the control of the water supply by the consumers, or by a representative body, which could only be satisfied by purchase; that the close connection between public health and the water supply strengthened the feeling in favour of the municipalization of the water supply; that purchase would put an end to the continual and costly inquiries into the water question which had been going on for so many years; and that the argument in favour of purchase was especially cogent in London, because the Water Companies had evaded the system of competition which Parliament intended, and because the London system of re-valuation had unduly swollen water charges based on rateable value. On the other hand, it was argued that it was preferable, especially in London, to rely upon the interested energy of private enterprise, rather than upon any municipal or statutory body, for dealing with the water supply; and that it was inexpedient that any representative body, largely elected by the working classes, should, by taking over the water supply, become large employers of labour. Other similar views were expressed. The Commissioners conceived that they had not to decide between, or indeed to consider, these views of public policy, except in so far as they might have any bearing upon the questions referred to them. They were appointed, they say, to determine, as accurately as possible, "the expediency of purchase in the interests of ratepayers and water consumers, on financial grounds, and with regard to the future as well as the present requirements of Water London."

At an early period of the inquiry, it became necessary for the Commissioners to consider whether it was their duty to re-open any of the questions dealt with by Lord Balfour's Commission of 1892-3; and they came to the conclusion that it was not. At their sitting on Dec. 6, 1897, they announced that, speaking generally, they accepted the findings of that Commission. This decision had the effect of excluding a good deal of evidence which the county of Hertford and the London County Council were desirous of adducing to controvert the conclusions come to by Lord Balfour and his colleagues. But while that Commission reported, in effect, that the sources available within the watersheds of the Thames and the Lea were adequate in quantity and quality for a period of forty years from the date of their appointment, they had not to consider, and did not consider, the cost of providing from those sources the requisite additional supplies. Since 1891, two or three periods of prolonged and unprecedented drought have occurred, which, no doubt, showed that in such years it would be much more costly and more difficult than had previously been supposed to procure from the Thames and the Lea the necessary supplies; and the County Council contended that, on financial as well as on general grounds, it was better to go at once to certain sources in Wales which their Engineer had examined. The Commissioners felt bound, therefore, to embark on the inquiry whether the method of meeting the prospective requirements of Water London proposed by the Council or that advocated by the Companies was, on financial grounds, most worthy of adoption. The evidence bearing on this inquiry was voluminous and conflicting, and occupied much time. The estimates laid before the Commission differed so widely, and were of so technical a character, that they appointed, with the sanction of the Treasury, Colonel W. H. Rathborne, R.E., an Assistant-Commissioner to investigate and report upon them. His services were of great value in assisting the Commissioners to form an opinion on the cost of the competitive schemes. It was necessary to arrive at some approximate opinion on the absolute as well as the comparative cost, in order to form a judgment as to whether private companies would be capable of dealing with the financial problems of the future, or whether ownership and management by some public authority would be necessary or expedient; and also in order to estimate the financial position and the liabilities of those who would have the task of supplying the area of Water London during forty years from the date of the inquiry.

The Commissioners then deal with the financial position of the Water Companies, and the extent of their operations. They show that the ordinary stock of the Companies in 1897 was of the nominal value of £10,228,548, the market value of which, at the prices ruling at the close of the year, was £32,645,189. In June, 1898, the Companies had, besides the ordinary stock, preference stock to the amount of £801,676, bearing interest at the rate of 5 and 4½ per cent.; making a total annual interest of £39,271. They had irredeemable debenture stock amounting to £4,250,110, with an annual charge for interest, at 5, 4½, and 4 per cent., amounting to £175,557. They had debenture stock amounting to £1,109,950, redeemable at par at various dates between 1919 and 1922, the annual interest on which, at 3 and 2¾ per cent., amounted to £33,174; and the Kent Company had a mortgage of £42,000, with an annual charge, at 3½ per cent., of £1470. The preference and debenture stock and the mortgage amount together to £6,203,736, with an annual charge of £249,472; and the value of such stock on the basis of 2¾ per cent. interest, with the addition of the £42,000 mortgage, is £9,060,254. Adding the share and loan capital together, a total of £16,432,284 nominal, and £41,705,443 market value is reached. The net profits in 1897 amounted to £1,032,728; and the dividends on the shares were £973,741. The figures for net profits and dividends in 1879 were £717,470 and £733,850. The average annual dividend for the five years 1893-7 was £943,806. The amounts of back dividends claimable in March, 1897, on six of the Companies, reached a total of £5,732,856, on a share capital of £7,053,524, or more than 81 per cent.; and the Commissioners point out that it is only when these arrears have been paid, and a reserve fund built up, that any surplus profits beyond the maximum dividend in any year are directed to go in reduction of the rates charged for water. There is a sum of £5,024,500 of capital authorized, including £1,250,000 for the Staines Reservoirs Committee, but not yet issued, except as to some of the Committee's debentures.

The Commissioners experienced much difficulty in ascertaining the population served with water by the Companies in any year but that of the general census. From figures given in the report of the Local Government Board for 1898-9, it is estimated that during the year ended Dec. 31, 1898, 5,814,219 persons were supplied. According to the Companies' returns for 1898, the estimated number was 5,819,583, of which 4,478,396 were within, and 1,341,187 beyond the County of London. The area supplied is 120 square miles within, and 230 square miles outside the county. They supplied the above population with an average daily quantity of 204,053,955 gallons of water from all sources. In 1895, it was 211,986,498 gallons; in 1896, 197,988,052 gallons; and in 1897, 202,102,544 gallons. During the past 17 years, the daily average quantity supplied per head per day has varied from 30·32 gallons in 1883, to 35·43 gallons in 1897, and has shown a gradual increase.

In considering the question of purchase, the Commissioners deal first with the debenture and preference stocks and the mortgage debt of the Companies; and they express the opinion that there is no way of dealing with them except by the purchaser taking them over from the Companies. They point out that in the provincial transfers, the purchasing authority, as a rule, took over the debenture stock of the company purchased, without any provision for redeeming it. They think that irredeemable debenture stock should not be converted into redeemable stock, even if secured upon rates, without the consent of the stockholders. The redeemable stock and the mortgage should be taken over, with the same power of redemption optional on the part of the purchasing authority. The preference stock does not stand in quite as secure a position as debenture stock. It was suggested on behalf of the County Council that it would be sufficient to pay off those preference shareholders at the market price of their stock at the date of purchase. The Commissioners think it would not be unreasonable to value the stock, as a trustee stock, on the basis of 2¾ per cent. On this basis, it would be worth £1,428,036. The Commissioners say it is impossible for them to foresee how Parliament, in the event of purchase being determined upon, would deal with these different classes of stock. For the purpose of their further inquiry, they assume that they are taken over by the purchasing authority as they are, and that the total interest charge—amounting, as already stated, to £249,472, including the interest on the outstanding mortgage—has to be deducted from the gross profits available for the purchaser.

In the next section of the report, the Commissioners deal with the important question of the method of fixing the price of the undertakings; this being, they say, a necessary preliminary to determining whether or not purchase is likely to be financially advantageous to the consumers. They think it is scarcely possible, in view of what has already taken place in this direction, to expect that the price can be settled by agreement; and therefore the only other method of doing it is by arbitration. They record at length the proceedings of the London County Council in this matter, from the time of Sir Matthew White Ridley's Committee in 1891 down to last session. In order to ascertain exactly what were the views of the Council on the question of arbitration, their representative was asked, in the course of the inquiry, whether their contention was that the purchase of the water undertakings would be expedient on any, or only on certain special terms of arbitration. The answer, which was given in writing, under the authority of the Water Committee of the Council, concluded as follows: "The Council's view has been that the position of the Metropolitan Water Companies differs in many respects from that of similar undertakings with which Parliament has hitherto dealt; and its contention is that the fair value of the Companies' undertakings should be ascertained by a court of arbitration of the highest standing, with the fullest powers to inquire into all the circumstances of each individual case." The Commissioners remark that the history of

the special arbitration clauses proposed by the Council shows that they "think it necessary, in the interests of the ratepayers and consumers of water, to guard themselves against an arbitration conducted on ordinary terms under the Lands Clauses Act."

In order to appreciate more clearly the object of these special arbitration clauses, the Commissioners proceed to examine the contentions put forward to show why the purchase value of the water undertakings ought not to be ascertained by the ordinary method. They refer to the fact that much stress is laid on the point that the London Water Companies have no monopoly, but are liable to competition. The history of this matter is somewhat involved; and the Commissioners deem it advisable to review the position of the Companies from the year 1806 down to 1821, when the arrangements and agreements existing between them were all brought before a Select Committee of the House of Commons, appointed to inquire into "the past and present state of the supply of water to the Metropolis." The Committee, in their report, recognized that several of the Companies were instituted by Parliament on the principle of encouraging competition, and that none of them had any claim to exclusive privilege of any sort. But they expressed the opinion that, from the peculiar nature of these undertakings, the principle of competition required to be guarded, in its application to them, by particular checks and limits, in order to avoid ruin to the Companies, and ultimately serious injury to the public; and that the agreements and arrangements by which they had partitioned the supply of the town among themselves, "although they bore the appearance of a combination against the public, were nevertheless measures of self-preservation, without which all but one or two of the wealthiest Companies would have been extinct" At that time, the Companies were not limited in the amount they could charge for water. The Commissioners point out that the Water-Works Clauses Act, 1847, embodies an attempt to carry out the suggestions of the Committee of 1821 as to competition guarded by checks and limits; and by section 35 it creates a right in owners and occupiers of houses within the area of a company to compel the company to furnish a supply, provided their number was such that their water-rates should amount to one-tenth of the expense of laying down pipes for the required supply, and provided they severally bound themselves to take the supply for three years at least. Parliament did not, however, think fit to apply even this guarded form of competition to all the Water Companies.

Other contentions put forward by the County Council were that some of the agreements by which the Companies bound themselves not to compete were illegal, and ought not to increase the value of the undertakings; that the rates charged for water were maximum ones, and that the Companies had, in 1852, given a pledge to Parliament that these should not be charged in all cases, or even in the majority of them; and that their capital ought to be revised, on the ground that in the case of three Companies it included items which were not sanctioned by Parliament, and that in the case of all of them "it included sums which had been expended many years ago on works or plant which had been abandoned or had become obsolete, and which no longer corresponded to effective works capable of producing income." These contentions are all carefully examined, and their value appraised, by the Commissioners. With respect to the last, which is dealt with at the greatest length, they say the Council claimed that the revision should go back to the commencement of each Company, and that the capital should be cut down by eliminating all that is obsolete, and reduced to an amount represented by actual works in use at the present moment. If this contention were sound, it seemed logically to follow that the revision must take place periodically—not, perhaps, annually, but whenever there was a change of intake, or some large change with regard to a company. It was also contended that the Companies—at any rate, in the period before 1871, when the Government audit was introduced—devoted too much of their annual revenue to dividends and interest, and too little to maintenance; and that they did not charge to revenue items which ought to have been so charged. The Commissioners remark that the contentions concerning the revision of capital and income were put forward as having more relation to the question of control than to that of purchase; but "it was insisted that the arbitrator who had to determine the value of the undertakings should take into consideration, as an element, the relationship of capital to actual works, that he should have some powers of estimating the value of the undertakings upon a valuation of the works, and that he should bear in mind the circumstance that there are obsolete works, in assessing the number of years' purchase he will award." Another matter of contention on the part of the County Council was the question of back dividends and the method of raising capital by a company before the auction clauses were introduced. In regard to this, the Commissioners say the legal right of the Companies to pay back dividends to their shareholders, and to give them the benefit of the premium obtained on shares issued at par, appear to them to be incontestable.

A further matter affecting the value of the Companies' undertakings, and therefore proper to be considered in an arbitration to determine that value, was, in the view of the County Council, the method of charging for water by a percentage on the rateable value of the property supplied. The Commissioners deal with this subject at considerable length; making frequent reference to the evidence submitted to them on the point. They freely acknowledge that the rating powers of the Companies are various, and sometimes ambiguous, and that the charges they are authorized to make grow with the rateable value, although the premises remain the same. But they express the opinion that "these variations in the charges allowed by statute to the different Companies, and the supposed automatic and unwarranted rise in their profits from increases in the rateable value of Metropolitan premises, hardly supply valid grounds for attacking their revenues as inequitable." They add that "this contention could not be advanced in any arbitration without setting aside and disregarding the statutory rights of the Water Companies." The views of the Commissioners on this matter, which has been the subject of much dispute, are so definitely expressed, that we reproduce this paragraph of the report. It runs as follows:—

> Parliament, in 1847, deliberately adopted for all water undertakings the principle of paying for water "according to the annual value" of the tenement supplied; such annual value to be ascertained, in case of dispute, by two Justices. After the decision of Dobbs' case in 1883, the Act commonly called Torrens' Act was passed in 1885, declaring that the "annual value" mentioned in the Water-Works Clauses Act, 1847, should, in the unions and parishes subject to the Metropolitan Valuation Act, 1869, mean "the rateable value as settled from time to time by the local authority." This enactment was passed with full knowledge of the fact that the effect of the Metropolitan Valuation Act was to raise the rateable values of many premises. Large sums of money have from time to time been advanced on the faith of these enactments and of the Special Acts of the Metropolitan Water Companies, by which they were enabled to charge a certain percentage on the annual value of the premises supplied. It is true that the percentage has been reduced for some of the Companies; whereas in the case of the Lambeth Company, although they have been before Parliament many times since their scale of charges was fixed, Parliament has not thought fit to reduce such charges. It appears to us that any arbitration to ascertain the value of these Companies must proceed upon the basis of these statutory rights; and that the arbitrator should not take upon himself to consider whether Parliament would or might curtail them, and, therefore, to assign to the Companies a lower compensation, on the ground of the probability of such interference with existing statutory rights. And it is precisely in order to enable the arbitrator to take that course that the special arbitration clauses we are considering have been framed.

In closing their remarks on this subject, the Commissioners say they have thought it worth while to consider at some length the contentions put before them by the County Council, because they illustrate and explain the special terms of arbitration they demanded. The Commissioners are disposed to agree with the opinion expressed in the House of Commons by Mr. Chamberlain on March 24, 1896, that these terms are "so exorbitant and unreasonable that they could not be conceded by the Government or the other interests concerned," and with the opinion expressed by Sir W. Harcourt in August, 1893, in reply to a deputation, when he said: "I cannot myself accept the proposition that you could deal with the Water Companies, or any other person, by simply repealing their rights, and making their rights what you choose them to be." The Commissioners call special attention to the fact that the City of London, speaking through their Remembrancer, informed them that they had always held that they could not hope for these special arbitration terms. The Commissioners admit that there have been cases where Parliament has sanctioned such terms. For instance, under the Housing of the Working Classes Act, 1890, and under the Local Government Act, 1894, the Arbitrator is directed not to give any compensation for compulsory purchase; and in the arbitration to settle the affairs of the Chatham and Dover Railway Company, the Arbitrators were empowered to deal with contending interests as fully and effectually as could be done by Act of Parliament. The case of the Metropolitan Water Companies and their compulsory purchase does not appear to the Commissioners to be analogous to these instances. They say: "The Companies have, upon the whole, performed their duties to the public satisfactorily and well. Most of them have gone through periods of struggle and difficulty, during which the shareholders ran considerable risks, and received inadequate returns for their money. Some have now reached, and others are approaching, a more prosperous condition, by the help, no doubt, of great privileges which Parliament has given them. We see nothing which leads us to suppose that, if these undertakings are compulsorily purchased for the public advantage, Parliament will sanction any exceptional provisions, or depart from the terms of arbitration usual where the property of private persons is taken from them against their will. We shall therefore assume that, if the policy of purchase is adopted, the price of the undertakings will be determined by an arbitration conducted on the lines of the Lands Clauses Act; although, possibly in view of the magnitude of the undertakings, a different constitution of the tribunal may be adopted."

The next point considered by the Commissioners is what the financial results of such an arbitration are likely to be. They review the proceedings of the County Council in opposition to the various proposals brought forward since 1891. In a memorandum presented to the Water Committee of the Council in February, 1894, the Chairman (Mr. W. H. Dickinson), discussing the question of purchasing the undertakings of the Water Companies on arbitration terms, said he thought it must be taken for granted that the figure an arbitrator would name would not be less than £30,000,000. He said he did not see how any arbitrator could, under the present law, "do otherwise than assess the value on the basis of present income. Parliament could adopt another plan; but no other authority could do so." The Commissioners agree with Mr. Dickinson that the arbitrator "would, and should, base his estimate, in the first place, upon the existing net income of the Companies, so far as it is legally raised, and as it has been allowed by the Government Auditor from time to time." They say he ought next to consider whether that income is stable or unstable, with a view to determine the number of years' purchase which will represent its true value to the shareholder. In considering this point, any capital expenditure necessary to maintain the income would properly be taken into account; while it must be borne in mind that the Companies are under an obligation to maintain a proper supply of water for the whole of their respective districts. The shareholders ought to receive such a sum as would purchase an equally good security producing the same income. If this calculation were accurately and fairly made, it would seem that there would be neither loss nor gain to the purchaser. He would receive the equivalent, and no more than the equivalent, of what he paid. If, however, the purchaser were in a position to borrow on the security of rates as well as of water charges, and if he had the option, as he ought to have, of paying in cash the amount of compensation awarded, it might well happen that he would derive an advantage from the fact that he would be able to borrow the necessary amount at a lower rate of interest than the water shares were taken as earning.

Dealing further with this branch of the subject, the Commissioners say the purchase of the share capital of the Water Companies is not likely to be attended, under a just award, by much profit or loss. There is no doubt a chance of profit, by reason of the purchasing authority being able to borrow at a lower rate of interest than that rate at which the water income is taken by the arbitrator. Against this, however, must be set the items for prospective income and for compulsory sale; and it is not certain which way the balance would lie. But in the event of a purchase by a public authority, it has been the practice of Parliament to require that a sinking fund shall be set aside to repay the sum borrowed within a period of 60 years. Considering the magnitude of the operation and its permanent results, the Commissioners think it would not be unreasonable to allow a term of 80 to 100 years; but even if that concession were made, the financial results, they say, are serious. It

would not be prudent to calculate the accumulations of a sinking fund on the basis of more than 2 per cent. interest. On that basis, the annual sum required to redeem £1,000,000 in 60 years would be £8767 19s.; in 80 years, £5160 14s.; in 100 years, £3202 15s. These amounts, multiplied by the number of million pounds required for the purchase, represent an annual charge over and above the interest on the borrowed purchase-money. The Commissioners next inquired how far the added expense of a sinking fund would be counterbalanced by economies which could be secured by a public authority purchasing the eight undertakings. These economies were estimated by Mr. Haward, the Comptroller of the London County Council, at £50,000 a year, made up of several items. This witness put before the Commissioners a calculation intended to show how many millions the Council could afford to give, without loss, for the water undertakings. He reckoned an amount of £980,000 available for interest and sinking fund, apart from any economies the purchasing authority might be able to effect. These, as already stated, he estimated at £50,000. Adding this sum to the £980,000, he brought out an income of £1,030,000 available for interest and sinking fund. He assumed that the Council would borrow at £2 12s. per cent., and he calculated the sinking fund on the 2½ per cent. table. On this basis, the charge for interest and sinking fund on £1,000,000 would be £33,353 if repayment was to be in 60 years, £30,026 if it was spread over 80 years, and £28,312 if 100 years were allowed. The available income of £1,030,000 would therefore suffice to pay interest and sinking fund on 30·88 millions for a 60 years' term, on 34·03 millions for an 80 years' term, and on 36·38 millions for a 100 years' term. The Commissioners say Mr. Haward's figures need correction, as he has estimated his interest and sinking fund in "too sanguine a spirit." They consider that if the Council had to borrow 30 or 40 millions, the interest they would have to pay would be nearer £3 than £2 12s. per cent.; and it would not be prudent to assume that a sinking fund could be accumulated at a higher rate of interest than 2 per cent. If, therefore, interest is taken at 3 per cent., and the sinking fund calculated on the basis of 2 per cent., the annual payments per million for interest and sinking fund would be £38,768 on 60 years for repayment, £35,161 on 80 years, and £33,203 on 100 years. The income of £980,000 would thus be sufficient to pay the interest and sinking fund on 25·27 millions, 27·87 millions, or 29·51 millions, according as the term of repayment was 60, 80, or 100 years.

Another point raised by Mr. Haward to establish the financial advantage of purchase was that the income available for the purchasing authority would be the full net income of the Companies; but that, inasmuch as they had to pay considerable sums to the Chamberlain's sinking fund—sums estimated at £56,000 a year in 1901—the income which they had to sell, and on which an arbitrator ought to assess their value, would be their net income *minus* the sum payable to the Chamberlain. In Mr. Haward's view, the purchasing authority, not having to make payments to the Chamberlain's fund, would enjoy the full net income without deduction, but would pay for only the net income *minus* the deduction. The Commissioners remark that the practical effect of the sinking-fund clauses has hitherto been small, because the dates when payments to the Chamberlain become due have not arrived. They recognize that, in any Act of Parliament authorizing purchase, these clauses would have to be considered and dealt with. If the Act left them unrepealed, the purchaser, who must take over the obligations as well as the rights of the Companies, would have to continue the payments to the Chamberlain in the same way as the Companies would have done. The income to be purchased would, in that case, be smaller; but it would be the same income as that sold. The Commissioners think it is not improbable that Parliament would direct the amount accumulated in the hands of the Chamberlain, up to the date of purchase, to be employed in aid of the purchase-money; but this amount will be insignificant, if purchase takes place at an early date.

We shall deal further with the report next week.

Press Opinions on the Report.

"The Times," in the course of a leading article on the report last Tuesday, said: "What the Commission recommends is purchase by an independent and permanent authority to be created by Parliament, which should hold the whole water supply in trust for the whole population of Water London, and which should be strong enough and impartial enough to administer the whole for the benefit of all. It admits, however—and this is very interesting—that such a body, purchasing on equitable terms, and required to provide a sinking fund to repay capital and interest in 60 or even in 80 years, would encounter a deficit in the income produced by the existing rates. In other words, it would have to increase the charges to the consumer. Were it to embark upon the undertaking of bringing water from Wales, its deficit would be yet greater. But, on the other hand, were Parliament to dispense with a sinking fund, the Commission thinks that by maintaining the existing charges a purchaser would pay his way, and might effect some reduction of charge at an earlier date than that at which the Water Companies will reach their maximum dividends. The Commission sees no need for going to Wales; believing, after re-examination of this question, that Lord Balfour's Commission was right in holding the supply from the Thames fully adequate, with proper storage, for all the needs of Water London up to 1941, even supposing (what is by no means certain) that the population goes on increasing at its present rate."

The "Standard" thinks it would be too much to assume that the report represents the last word in the protracted controversy to which it is the latest contribution. But it acknowledges that it is, at all events, what it purports to be, the "final" judgment of the body appointed to investigate the question. The effect of the various recommendations is, our contemporary says, "dead against the scheme to which Spring Gardens has committed itself. The Royal Commission is in favour of expropriating the existing Companies, and of entrusting the duty of effecting the purchase, and leaving the subsequent management of the water supply, not to the London County Council, but to a permanent Water Board. . . . A more careful and practical report could not have been desired."

The "Morning Post," which, as already mentioned in the "JOURNAL," a few months ago devoted a series of articles to the London Water Question, says: "It has long been conceded by most people that the water supply of London would have to be taken up as a public question which concerned more than the inhabitants of London; and three years ago the Government gave its pledge that it would be so taken in hand and treated. Next session we may see the findings of the Royal Commission bearing fruit. On the main question whether the existing Water Companies should continue their separate work or whether they should be bought out, the Commission pronounces for purchase and ultimate management by a single public authority. There are sufficient reasons for that decision; but one of them is not the ineptitude of the Companies, who have, on the whole, done their work well, and without question until the London County Council began ten years back to abuse them. It is further found (it might have been almost taken for granted) that the Council would not be a fit 'public authority' to take charge of the water supply—for this reason, among others, that the jurisdiction of the Council is not commensurate with the areas of the Water Companies. The reason is good enough, though some of the 'others' would be better. At any rate, it is satisfactory that the exclusion of the Council is unequivocal. The suggestion of the Royal Commission accords with our own—that there should be a Water Board in touch with the Government, if not exactly a new Government Department, on which should be conferred powers of purchase and supply."

The "Daily News" regards the report as a "very disappointing document." While acknowledging that Viscount Llandaff is "an extremely clever and accomplished man," it is said that he "lacks a judicial mind, and from the first showed a violent prejudice against the London County Council." Our contemporary says: "The County Council are the only body which has offered to purchase the property of the Companies; their credit enables them to do so; and they are, by all analogy, the right people to undertake the business. But the Commissioners decide against them, on the flimsy and inadequate ground that the area now supplied by the Companies includes Hertfordshire and parts of other Home Counties not under the jurisdiction of the Council. This is a mere question of apportionment, which could easily be settled by practical men. It is absurd that four millions of Londoners should be deprived of their rights, lest a few hundred thousand residents outside the Metropolis should have their water from a Metropolitan source. The Commissioners actually recommend the revival of a Water Board, such as Lord James's Bill provided in 1896, with the result of pleasing neither the Companies nor the public. This means doing nothing; for such a Bill would have no chance of becoming law."

The "Daily Chronicle" gladly recognizes in the Commission's report "an absence of any tone of hostility towards the London County Council." This, the "Chronicle" says, "is not, perhaps, so strange as may at first appear, seeing that the Commission appointed to curse has been constrained to bless the main proposal of London's County Council—namely, purchase for the public of London's water supply. But when we have paid this tribute to a Water Commission's chastened mood, there is little that we can add in the way of compliment to the outcome of the Commission's labours. The practical conclusion of the report is that the Companies must be bought out by the public—*i.e.*, the ratepayers—at a figure which will involve a heavy annual loss. In spite of obsolete plant; in spite of notorious deficiencies in the past; in spite of the fact that the Companies' undertakings are even now under the necessity of incurring heavy additional liabilities in order to perform their statutory obligations; in spite, finally, of the fact that the public can borrow more cheaply than a private company—the conditions of purchase are to be such that there shall not only be no question of public profit, but the certainty of increased water charges to the consumers or increased rates to the ratepayers. We have no hesitation in saying that by such a conclusion the Commission has largely discounted the value of its long, and in many respects able, report; for this proposition, to which it has given the weight of its authority, is, and must always be, absurd."

The "Financial News" thinks the report has really "solved satisfactorily a problem whose urgency was only exceeded by its perplexity." It says: "The most conservative among us had become convinced of the need for public control of the Metropolitan Water Supply; but the most moderate and progressive of Londoners (we are not using these words in their technical party sense) shrank from the only alternative to the existing system hitherto put before the public—the acquisition and control of the supply by the London County Council. So strong and widely spread is the dislike with which this alternative has been viewed, that it is likely that reform would never have come had not some other way been found. Englishmen do not like to have their important public services run by a political caucus. And that is the function to which the active Progressive spirits of the London County Council have effectually reduced that body. There is inherently no reason why the water supply of a municipality should not be entrusted to the ordinary municipal authority; but there are in everyone's mind (outside the Fabian Society and the Socialistic Radical Clubs) numerous reasons why the water supply of London should not be entrusted to the municipal authority of London. Apart from the circumstance that Water London is larger than the County of London, it is not deemed desirable to give the London County Council more powers to abuse. This is the view which has been consistently advocated in these columns for years past; and we are glad to find the Water Commission endorse it."

The "Globe" last Tuesday contained the following remarks upon the report: "The report of the Royal Commission on the present and future water supply of the Metropolis presents such a wide variety of highly important questions as to necessitate mature consideration before final judgment is delivered. The Commissioners' scheme is the outcome of much painstaking care. But the labour bestowed on its evolution will not commend it in the slightest degree to the approval of the Progressives. Their pet project—the bringing of water from South Wales—is summarily rejected, for several good and sufficient reasons. It would enormously increase the expenditure, while this outlay would be wholly unproductive during the period of construction—from ten to fifteen years. Moreover, during last year's prolonged drought, the very rivers from which the supply would have to be taken fell so low that a genuine water famine prevailed for a time in the adjacent country. As regards the financial aspects of the scheme, it is most right that a municipal body with such a monumental capacity for mismanagement and extravagance as the London County Council should only share the control to a limited extent."

In an article entitled "Purchase with Payment" which appeared last Tuesday, the "Pall Mall Gazette" said: "The report of Lord Llandaff's

Water Commission has taken some time to compound; but the most critical of its examiners will admit that the Commissioners have deliberated to good purpose. Their report is a masterly and a comprehensive review of this most important question. It deals with every possible point of controversy; examines every contested figure; and, after combing out every shred of expert testimony from both extremes, it puts forward a scheme that is tangible and fair to every interest concerned—and to that of the consumers not the least. It did not take the Commissioners long, apparently, to decide that it is desirable that the undertakings of the Water Companies supplying the vast Metropolitan and extra-Metropolitan area known as Water London should be acquired and administered by a single central authority. Following quickly upon that decision came the conclusion that the Water Authority for this great area should not be the London County Council. These two conclusions, bracketed, will square admirably with the views of the 'man in the omnibus.' The authority recommended is a Water Board on somewhat the same lines as that proposed by Lord James in his Bill of 1896. . . . We see no reason why the Government should not at once place the matter before Parliament, and invite the co-operation of moderate men on both sides of the House to settle this important question on the principle outlined in the report of Lord Llandaff's Commission."

The "Westminster Gazette" considers the report as "not very comforting"—admitting present defects, but providing no practical remedy for the future. Our contemporary says: "It did not require the collective wisdom of Lord Llandaff and his colleagues on the Commission to prove to London householders that the present system of water supply is dangerously unsatisfactory. What we wanted was some feasible scheme for ensuring safety and plenty in the future; and it is giving a stone instead of bread to suggest, as the Commission does, a revival of the Water Board idea—a Board on which the London County Council is to have one-third of the representation. The Thames and the Lea are still to be the sources of our supply, and the compensation to the existing Companies, unlike the probable water supply, is to be ample. We do not think that the public will accept these conclusions as by any means final."

The "Spectator" says: "Either the London County Council must control and administer the water supply of London, or a Water Board for the purpose must be constructed. We agree with the report that a special Board would prove to be the best solution of the problem."

The "Saturday Review" says the report may be regarded as "a satisfactory document," though it will be disliked by the London County Council, "whose policy it condemns in most particulars." Our contemporary says the Government were justified in appointing the Commission, and they must now complete their work by the translation of the report of that Commission into law. It may not be possible to do this in the present session, but it is thought that "the following year should close this long controversy by fact." The hope is expressed that the Directors and shareholders of the Water Companies will "bow to the clear and unanimous verdict of an impartial tribunal, and will not offer opposition to what is found to be in the public interest."

"Engineering" says that "if anything is capable of bringing the Metropolitan Water Question to an issue, it should be the report of Lord Llandaff's Commission." Our contemporary thinks "it will be agreed by most persons who read the report that the conclusions arrived at are framed generally on common-sense principles, though there may be differences of opinion in regard to the distribution of patronage in the nomination of members of the Board." On the whole, "Engineering" regards the suggestions set forth in the report as "the most promising basis for legislation yet brought forward."

The "Engineer" gives the salient features of the report, in which it has failed to find "any proper case made out against the Water Companies;" nor can it see any clear proof therein "that the consumers are going to benefit to any appreciable extent." Our contemporary holds the very strong opinion that, on the contrary, they might suffer. The Editor would not be at all surprised to find, if the entire proposals of the Commission should be carried into effect, "that the water rates would go up instead of down," and that we should be "in a much worse condition than we are now."

The "Lancet" is by no means inclined to agree with the report in its entirety. But with regard to the London County Council not being recommended as the authority to have charge of the water undertakings, it says: "There are many ways in which the Council can be useful to the water consumers of London without straining for the absolute control which the Commissioners advise Parliament not to confer upon them. They have not always used the powers which are already in their possession for the protection of the consumers. We trust they may now find time to attend to this work."

The "Municipal Journal" knows why the Royal Commissioners have taken so long to produce their report. It is because they have been engaged in "building up an elaborate apology for the water monopolists, and in preparing a detailed criticism of all the evidence lodged against them, more particularly when the testimony emanated from the London County Council." The organ of that body considers that "the Commission has proved itself to be one of the most useless which ever met. There is nothing new in its report. It has learned nothing, and has forgotten everything—except all that went to favour the interests of the Water Companies." The Editor comes to the conclusion that all the Commission has done is to "block the way of reform in another useless Blue-book."

The "Local Government Journal" characterizes the report as "one of the vaguest documents ever issued to a long-suffering public." It is said to bear on the face of it "the stamp of insincerity," and to be "not worth discussing in a serious vein."

What Progressive County Councillors Think of the Report.

On the resumption of the sittings of the London County Council last Tuesday, a representative of the "Daily Chronicle" had a chat, in the lobby at Spring Gardens, with several members of that body on the subject of the report. He recorded their expressed opinions next day as follows:—

Dr. Collins was very emphatic. "A body which is responsible to nobody ought not to be trusted by anybody," he said. "That was the criticism I passed on the Water Board proposed by Lord James, and it applies equally to the present scheme. Under it, every interest concerned

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 260.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20¼–21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14½–15½	..	4 16 9
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100–102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	5¾–6¼	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4–4½	..	5 6 8
880,000	Stk.	Aug. 16	12	Brentford Consolidated	275–280	..	4 5 9
270,000	,,	,,	9	Do. New	210–215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	124–128	..	3 2 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	255–260	+2½	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk.	185–190	+2	4 9 6
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125–130	..	3 16 11
420,000	20	Sept. 29	10	British	43½–44½	..	4 9 10
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c.	25–27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	19–21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾–10½	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	98–100	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd.	28–29	..	5 13 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13½–14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56–58	..	5 3 5
550,000	Stk.	Oct 13	13½	Commercial Old Stock	305–310	..	4 7 1
200,750	,,	,,	10½	Do. New do.	240–245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb.	140–145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177–181	..	4 19 5
200,000	,,	,,	7	Do. 7 p. c. Pref.	178–183	..	3 16 6
51,600	Stk	Aug. 31	14	Croydon A 10 p. c.	335–340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c.	265–270	..	4 1 5
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p. c.	125–130	−3	4 0 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
486,090	10	Jan. 26	11	European, Ltd.	20½–21¼*	..	5 2 4
354,060	10	,,	11	Do. £7 10s. paid	15–16*	..	5 3 2
14,993,075	Stk.	Aug. 16	4%	Gas-light and Coke	4 p. c. Ord.	+1½	4 9 1
2,500,000	,,	,,	3½		3½ p. c. max.	+1	3 10 0
3,799,735	,,	,,	4		4 p. c. Con. Pref.	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	+1	3 0 7
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13½–14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental	213–218	+1	4 11 9
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101–104	..	3 7 4
75,000	5	Dec. 14	6	Malta & Medn., Ltd.	5–5½	..	5 9 1
560,000	100	Oct. 2	5	Met. of Melbourne and Deb.	5 p. c. Deb.	..	4 7 9
250,000	100	,,	4½		4½ p. c. Deb.	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd.	11–12	..	5 0 0
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.	220–225	..	4 2 3
264,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.	104–107	..	3 5 5
60,000	5	Sept. 29	7	Ottoman, Ltd.	5⅞–5¾	..	6 1 9
					* Ex div		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd.	7–7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼–6⅝	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼–1⅝	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago 2nd Mtg. Bonds	102–106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord.	10⅞–11¼	..	6 4 5
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	99–101	+1	3 19 3
250,000	10	Sept. 15	10	San Paulo, Ltd.	12–13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.	249–251	..	3 19 8
209,053	,,	,,	10	Do. B.	249–251	..	3 19 8
447,427	,,	,,	10	Do. C.	249–251	..	3 19 8
5,600,000	Stk.	Aug. 16	5⅓	South Metrop., 4 p. c. Cnl.	133–136	..	3 18 5
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb.	100–102	..	2 18 10
120,000	Stk.	Aug. 31	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c. 4 p. c. Deb.	141–143	..	4 3 11
250,520	,,	,,	4½		102–104	..	4 6 6
55,100	,,	Dec. 14	4		113–117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.	8½–9½	−½	5 5 3
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	101–104	..	4 15 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.	307–312	..	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref.	157–162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145–150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb.	148–153	..	2 18 10
1,720,560	Stk.	Oct. 13	7	East London, Ord.	302–306	+1½	3 8 0
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.	145–150	..	3 0 0
890,000	,,	,,	3	Do. 3 p. c. Deb.	98–100	..	3 0 0
700,000	50	Dec. 14	7½	Grand Junction 10 p. c. max.	107–109	..	3 8 10
310,000	Stk.	Sept. 29	4	4 p. c. Deb.	131–136	..	2 18 10
708,000	Stk.	Aug. 16	14	Kent	348–353	..	3 19 4
160,000	,,	,,	7	Do. New, 7 p. c. max.	200–210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.	293–298	+1	3 10 6
406,200	100	,,	8	Do. 7½ p. c. max.	215–220	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb.	135–138	..	2 18 0
500,000	100	Aug. 16	13⅓	New River, New Shares	423–428	−2	3 3 0
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb.	130–135*	..	2 19 3
902,300	Stk.	Dec. 14	7⅓	South-wark and Ord.	202–207	..	3 12 6
126,500	100	,,	7½	7½ p. c. max.	190–195	..	3 16 11
489,200	Stk.	,,	5	5 p. c. Pref.	160–165	..	3 0 7
1,019,585	,,	Oct. 13	4	Vauxhall 4 p. c. A Deb.	131–136	..	2 18 10
1,155,066	Stk.	Dec. 14	10	West Middlesex	288–293	..	3 8 3
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	147–152	..	2 19 3
200,000	,,	Sept. 15	8	Do. 8 p. c. Deb.	100–102	..	2 18 10
					*Ex div.		

including that of the London County Council, will be in a permanent minority. The terms of purchase propounded appear to me quite unsound. I am also astonished at the Commissioners' views in regard to the use of flood water. I do not anticipate any better success for this Commission's report than that which befell Lord James's ill-fated Bill. No solution of the London Water Question will, in my opinion, be satisfactory until the London County Council is created the water authority for the whole area within the county."

Mr. John Burns had nothing good to say of the report. "It is nothing more or less," he said, "than another Jameson raid on London. Raids are popular just now, and this is one made in the interests of the water lords against the people of London."

Lord Carrington objected to the insignificant position allotted to the County Council on the Board. "I have always been a Council man," was his way of putting it, "and I hope always to remain one; and so any water scheme for London which places the County Council in a minority is to me unsatisfactory. On the other hand, there is ground for encouragement in the fact that the Commission recommends purchase. That is an advance, and the day may yet come when a Royal Commission may go the full length and give London what it wants."

Mr. W. Crooks, Chairman of the Council's Bridges Committee, declared that the creation of another indirectly-elected body in London would be a fatal mistake. "It will be another Thames Conservancy Board," he said, "and we know what little interest the people of London take in that body, and also the difficulty of keeping it up to a high standard of duty, simply because it is not directly responsible to the ratepayers."

Mr. Sidney Webb said: "I don't think London will put up with a Board dominated by two Government officers appointed by the Local Government Board; and I am not prepared to trust to such a body the negotiations for the purchase of so large a property as that owned by the Water Companies, when the ratepayers will be saddled with the cost."

Lord Tweedmouth thought the proposal in favour of purchase was one which fully justified the County Council's policy. As to the constitution of the Board, he would prefer not to express an opinion until he had more fully studied the report.

Mr. E. Cornwall said: "This proposed Board is utterly impossible. Why should the London Water Supply be treated differently from that of Glasgow, Liverpool, or Manchester, where the representatives of the ratepayers manage the undertakings themselves. The proposal that the Local Government Board should nominate the Chairman and Vice-Chairman of the proposed water authority would never do; it would simply mean another Thames Conservancy."

A Trades Exhibition is being held at Bishop Auckland; and prominent among the exhibitors are Messrs. John Wright and Co., Limited, of Birmingham, acting in conjunction with the local Gas Company. They make a good display of the "Eureka" gas-cookers, with all the latest improvements. Consumers are able to obtain these stoves from the Gas Company on a seven years' hire purchase system.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. W. Stevenson, the Sub-Convener of the Gas Committee of the Glasgow Corporation, was prompt in his action on Monday, at a meeting of the Corporation, in detecting a matter which, though in appearance small, might have had far-reaching consequences. In the minutes of the Cleansing Committee, it was stated that "a petition by the Secretary of the National Union of Gas Workers, &c., had been received for consideration." Mr. Stevenson pointed out that the Corporation General Department had already refused to acknowledge a petition coming from such a source; and he thought it should not be received there—that is, in the Police Commission. He moved that the matter be sent back to the Committee. Mr. Battersby, who is one of the supporters of the Union, explained that the petition was only received for consideration as to competence. An expression to this effect having been added to the minutes, Mr. Stevenson allowed them to pass. It is easy to perceive how, if the minute had not been challenged, it might have been used to show that the Committee had "recognized" the Union.

The troubles over the working of the steamship carrying coal for the Aberdeen Gas-Works have, according to latest information, been got over. So much was said in these "Notes" last week; but full information had not then been received. On the arrival of the vessel at Aberdeen last Saturday, the Captain reported to the Convener of the Gas and Electric Light Committee that, while the men were at dinner on the previous day in Leith Docks, a Trade Unionist representative—from Glasgow, he said, but that is immaterial—appeared among the labourers, and began to address them. He urged the labourers to cease work, and, it was reported, went so far as to offer them a monetary consideration if they did so. The men did not comply. Instead, their foreman informed the police; and, it is added, "the Trade Unionist deputy was at once arrested and removed from the vicinity of ths docks." I do not believe that he was arrested; he would be simply told to desist, and would, of course, comply, for those gentlemen know well where to draw the line. At all events, the vessel was loaded in Leith without further trouble. She was also discharged in Aberdeen without a hitch, sailed for Bo'ness on Wednesday, was loaded there without difficulty, arrived in Aberdeen on Thursday night, and was again promptly discharged. The working of the vessel would thus appear to be back to its normal.

The views of the Union on the subject are given in a resolution adopted by the Executive Committee of the Dock Labourers' Union (Aberdeen Branch), at a meeting on Monday night. The resolution is too long to be set out here; and, indeed, it is unnecessary to give the whole of it, because it deals in detail with a statement which has been made on behalf of the Gas and Electric Light Committee, some of the particulars of which it admits, and some of which it denies. The only denial of consequence—and it is made emphatically—is that the Union went to the men who discharge the ship. The men, it is said, went voluntarily to the Union and gave them the information; and the

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Union officials then, believing that a breach of contract had taken place, drew up a complaint on the men's behalf. This is not quite a likely step on the part of the men, because, if they were dissatisfied with their pay, and wanted Union rates, they had only to give up their work and join the Union. There are other vessels to discharge in Aberdeen besides this one. The fact that this did not take place, would seem to show that the non-Union men who work for this contractor know better than the Union men the possible conditions of labour at the port. Why, in the Aberdeen district, after raising two regiments of Gordons for service in South Africa, and a third for garrison duty in Edinburgh, there is a superabundance of free, unskilled labour, anxious to get away from the land to the better paid work to be had in the towns; and the cost of living in Aberdeen is considerably less than at any port to the south of it. The Union rate of wage is, therefore, more than is necessary, and more than can be enforced. In this resolution, complaint is made that the contractor for the discharge of the gas coal has, by offering lower rates, monopolized the work of the discharge of Scotch coal in Aberdeen. (It is mostly coal from the Tyne which is used there.) Probably he has acquired a monopoly. But it is enterprise; and that it is not an enterprise oppressive to the workmen can be affirmed, for they earn from 39s. to 40s. per week of 27 hours. One of the complaints of the Union is that the contractor himself pockets £4 per week from this ship alone; and another is that he employs three men in the canting department, instead of four, thereby depriving one man of the opportunity of earning a livelihood, and endangering the lives of the three men employed. This new version of three men in a boat is the only part of the complaint which could, by any possibility, make it relevant. The Gas Committee are doubtless fully aware of the circumstance. It is given, as a reason for the interference of the Union in the matter, that the rate of wages paid, being below the Union scale, is a violation of a resolution of the Town Council to the effect that all contractors be required to pay Union rates. This will, no doubt, be pleaded when the subject comes before the Town Council. The reply will probably be that the wages paid are in accordance with the practice of the port. In that case it will, in all likelihood, come to this—that in the end both parties will hold to their own opinions. But then, the Gas Committee will have got their coal, and effected the saving which they entered into the business with the view of securing.

The Water and Gas Committee of the Dundee Town Council have unanimously resolved to adopt hydraulic power, in preference to compressed air, for driving the stoking machinery in their new works. According to a report by their Engineer (Mr. W. M'Crae), the first cost of hydraulic machinery will be £6837, and the annual charge for maintenance £341 17s.; while the first charge for compressed-air machinery would be £8548, and the annual charge £427 8s. The Committee gave instructions for the machinery to be procured, as also four locomotive engines, a station meter, two Babcock and Wilcox boilers, and retorts and bricks. The erection of the new works is thus now fairly under way.

A Committee of the Dundee Town Council have also resolved upon a bolder step than any I have yet heard of, in connection with the introduction of the trolley-wire system of car traction into the city. The standards which are to carry the cables for the driving of the cars are also to be utilized as lamp-posts. There may probably be little difficulty in working two such systems of public service upon one set of standards. The one current will be overhead, and the other underground, so that the maintenance of insulation may be quite easy. But that it is not usual seems to point to some practical difficulty.

A conference was held in Leith yesterday between representatives of Leith and of the Edinburgh and Leith Gas Commissioners and the Edinburgh and District Water Trust, upon the subject of the formation of subways for the carriage of gas, water, and sewage pipes. An official statement of what took place is given. It appears that the proceedings were begun with a luncheon, at which there was much profession of good-will between the parties. This is certainly a new feature, and a hopeful one. At the conference, the scheme of subways which was suggested was explained by Mr. Baxter, of Leith. Thereafter comments were made upon it by Mr. Kinloch Anderson, as representing the Gas Commission, and by Mr. Archibald as representing the Water Trust. It is stated that "the result of a most pleasant and social conference was that all parties agreed to take the matter into consideration, and that, if necessary, further meetings would be held to discuss this and other mutual subjects." These meetings, I anticipate, will be few and far between, unless the practice of treating each other to luncheon should become the rage. If so, be sure that a fresh proposal for amalgamation of the two Municipalities is not far off.

On account of the increasing demand for gas at Johnstone, the Gas Commissioners there have had plans prepared for extension of the works, including the formation of a siding from the Glasgow and South-Western Railway Company's lines. The total cost is to be about £8000.

The "North British Daily Mail" of last Wednesday contained the following: "Up till now it has been within the power of the Board of Trade to grant licences to communities to municipalize the electric lighting of their towns. The power has not in any way been withdrawn by Parliament; but the Board of Trade have apparently made up their mind to grant no more licences. The matter is one of great importance to town councils and other local authorities concerned with the lighting of towns; and it ought to have their special attention forthwith, if they are not to be compelled to promote Provisional Orders in Parliament, or else fall into the hands of one of those private companies concerned for burghal enlightenment and dividends. Oban resolved not long ago, through its Town Council, to lighten up with electricity; and the Town Clerk wrote to the Board of Trade asking if it had any 'rules on the subject.' The reply of the Board of Trade was an eye-opener. 'They are not now disposed,' the Secretary was directed to say, 'to entertain applications for licences.' The Board consider 'that the power of granting licences was entrusted to them by Parliament, in order that statutory powers of lighting by electricity might be exercised by way of experiment.' Apparently, therefore, the days of 'experiment' have ended. At all events, in the opinion of the Board, 'the time has come when the longer tenure which can be given by Provisional Order alone may be adopted under conditions receiving parliamentary and not merely departmental approval.'"

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 27.

Sulphate of Ammonia.—The market has been active during the week; but towards the close it has become quieter—the quotations being £11 12s. 6d. to £11 15s. per ton f.o.b. at the ports. The bulk of the demand has been for prompt and near delivery, and mostly for "covering" purposes; but prompt prices have also been paid for February delivery. Production has been disposed of as it has become available; there being nowhere any disposition to stock. There has been less doing in the forward position; but this has been mainly owing to the firm attitude of producers. For delivery up to June f.o.b. Leith, £11 17s. 6d. per ton, ordinary terms, is required; while for London £11 16s. 3d, Beckton terms, is the quotation, February-April delivery.

Nitrate of Soda is firm at 8s. per cwt. for fine quality on spot.

LONDON, *Jan.* 27.

Tar Products.—The week has been marked by a good deal of excitement in consequence of the Government ban preventing the exportation of several important products. The restriction will seriously prejudice the position of many manufacturers; and it is felt that, if the Government pursues this policy in the interests of the general community, the serious loss which it entails should not fall upon the industry affected. Either the Government should purchase up the production at the price obtaining at the time of the proclamation, or compensate for loss in value which has since taken place. Ninety per cent. benzol is very flat; and, although for gas enrichment purposes 8d. per gallon has been realized, for ordinary manufacturing uses 7d. at country ports is not procurable. A more favourable freight, however, is obtainable in the Thames; and perhaps 7½d. to 8¼d. for odd lots might be realized. Fifties benzol keep fairly steady; toluol is neglected; solvent naphtha is not quite so strong; crude and heavy naphthas show no change; creosote is perhaps weaker; carbolic acid, according to locality, exhibits remarkable differences in market price; pitch is dearer, and stronger for forward delivery; and anthracene remains unchanged and neglected.

General values may be taken at: Tar, 17s. to 26s. Pitch, east coast, 35s.; west coast, 32s. to 33s. Benzol, 90's, 7d.; 50's, 10d. Toluol, 90's, 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 3d. Crude, 30 per cent., naphtha, 4½d. Heavy naphtha, 1s. 2d. Creosote, 3¼d. Heavy oils, 3¾d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 8d. Crude naphthalene, 52s. 6d. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia has continued a steady market. There are urgent buyers; but makers, in most cases being very free of stock, want more money than is now quoted. To-day's average value may be taken at £11 12s. 6d. per ton, less 3½ per cent.

The coal output on Vancouver Island for the past year exceeds that of all previous years in the history of coal mining there by nearly 50,000 tons, and for the fourth time passes the million-ton mark. In 1891, the output was 1,029,098 tons; in 1894, it was 1,012,953 tons; in 1898, 1,117,915 tons; and last year's record was 1,166,251 tons.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—An exceedingly strong position is maintained throughout the coal trade of this district; and the advance in prices on the part of the Lancashire coalowners reported last week has been followed in surrounding coalmining centres. The result is that the upward movement has been established without difficulty; buyers having no option but to pay the full prices—the question being more one of obtaining the requisite quantities. If anything, supplies are perhaps coming rather better to hand; and there is not quite so much complaint generally with regard to the restriction of the output by the colliers, who seem, now that the wages question has been finally decided, to be settling down somewhat more regularly to their work. The railway companies are also now dealing with the traffic in a fairly satisfactory manner. Notwithstanding all this, however, every description of fuel, except perhaps some of the very best qualities of house coal, continues exceedingly short; and collieries are still not able to do more than keep the works and mills of their regular customers supplied from hand to mouth. Where extra quantities have to be bought in the open market, these are only obtainable at special prices. The general pit quotations remain exceedingly firm at the advanced rates, averaging 14s. 6d. to 15s. per ton for best Wigan Arley, 13s. up to 14s. for Pemberton four-feet and seconds Arley, 12s. to 12s. 6d. for common round coal, with engine fuel 10s. for ordinary sorts and 10s. 6d. to 11s. for best slack. The opinion is freely expressed in some quarters that there is a danger of prices being pushed upwards to an excess; but no doubt one object in getting up list rates to the highest possible point is that this may be taken as a basis when the railway and gas-coal contracts come upon the market, and upon which it is becoming practically certain, as previously anticipated, there will be an advance of fully 2s. 6d. to 3s. per ton over last year's prices. The shipping demand continues exceptionally brisk; and as there are only limited quantities offering at the ports on the Mersey, higher prices have to be paid—16s. being obtained readily, with 6d. to 1s. above this in some instances stated as having been secured for special deliveries at the ports. There is a further upward movement going on in the coke trade. As manufacturers are all pressed for quantities in excess of what they are producing, they have recently been readily getting above their list rates.

Northern Coal Trade.—There is now a decidedly easier tone, the supplies of coal being normal, and the consumption in one or two branches showing a slight falling off. In the steam coal trade, though the demand is full for this season of the year, the price is easier than it was a week ago, and from 19s. to 19s. 6d. per ton f.o.b. represents the current quotations for best Northumbrian steam coals for early delivery. Steam smalls are 11s. to 11s. 6d. The demand for gas coal is still very full; but with a better output, heavy deliveries are now being made on contracts that were behindhand, and there is still only a moderate quantity for sale to occasional customers. For best Durham gas coal, the quotation for cargoes now varies from 17s. to 18s. per ton f.o.b.—which is considerably below the quotations that have been made since the beginning of this year. The coke trade is in undiminished activity; prices being firm, with higher

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000
HALIFAX	1,000,000	YORK	750,000
TORONTO	250,000	ROCHESTER	500,000
OTTAWA	250,000	KINGSTON, ONT.,	300,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000
MONTREAL	500,000	DULUTH, MINN.	300,000
TORONTO (Second Contract; Remodelled)	2,000,000	CATERHAM	150,000
BELLEVILLE	250,000	LEICESTER	2,000,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000
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quotations forward. Gas coke is steady. There is no change in the range of prices to notice this week.

Scotch Coal Trade.—The market has still an upward tendency, due to a continued home demand of great volume, and an increasing foreign business—chiefly the former. During the past week, the Conciliation Board have advanced the miners' wages by 9d. per day; but experience shows that high wages mean decreased outputs, and the prospect thus is that for some time high prices will rule. It has been pointed out that while miners' wages have been raised by some 3½d. per ton, the price of coal has been advanced by about 9s. per ton. It has to be taken into account, however, that the enhanced price is only upon new contracts, and that coalowners are not reaping so large a harvest as the market would lead one to suppose. The other side of the matter is that with current rates so high, coalowners who have contracted for a period are inclined to favour current buyers, and to give as little as they can to customers who hold contracts at lower rates. The market is complicated by foreign considerations; and the future depends upon them more than upon home demands. The quotations are: Main 13s. 6d. to 14s. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 15s. to 15s. 6d. The shipments for the week amounted to 201,314 tons—an increase of 67,823 tons upon the preceding week, and of 39,877 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 400,312 tons—an increase of 58,470 tons on the same period of last year.

Sales of Shares.—Last Tuesday evening Messrs. Kidwell and Son disposed of 500 £5 shares in the Chatham, &c., Water Company for £10 per share. They were part of the new capital authorized by the Company's Act of 1898. On Wednesday, Messrs. Spelman sold ten lots of £10 shares in the City of Norwich Water Company for £18 10s. per share. Other lots fetched £18 2s. 6d. and £18 per share. On Thursday, Messrs. Kidwell disposed of nine £3 6s. 8d. shares (7 per cent.) in the Rochester, Chatham, and Strood Gas Company, at £6 12s. 6d. each. On the same evening, Mr. G. Turner disposed of £280 of "A" stock of the Ipswich Gas Company (with accruing dividend) at £29 15s. per £10 lot; eight lots of "B" stock, at £23 per lot; and six similar lots at £23 2s. 6d. each.

The Rugeley Gas Bill to be Opposed.—A special meeting of the Rugeley Urban Council was held last Wednesday to consider the report of a Special Committee with respect to the Bill of the Rugeley Gas Company being promoted in Parliament this year. The Company, it seems, have been approached to make certain alterations in the Bill, especially with respect to the raising of the price of gas to 4s. 6d., and to providing proof of the Company having expended £4000 out of income for improvements. They also asked that the price of gas should be 3s. 6d.; that the Council should have a deduction of 20 per cent. for gas used for public lamps; and that the Council should have power to purchase the undertaking within a reasonable time, if they thought proper. The Company declined to accede to the main points. The Chairman said he did not think the Company had met the Council in the manner they should have done; and he should strongly advise the Council to oppose the Bill. A resolution to this effect was carried.

The Borrowing Powers of the Birmingham Corporation Water Department.—The Birmingham City Council last Tuesday approved of the proposal of the Finance Committee to borrow, from the Prudential Assurance Company, £500,000, at 3¼ per cent. interest, for the purpose of the Corporation Water Act of 1892. Alderman Clayton mentioned that the interest which would be saved by the arrangement would be something like £70 a week, that the total sum raised under the Act was now £2,153,200, and that there was still a large margin of borrowing power.

The New Gas-Works for Scunthorpe.—Tenders for the construction of their new gas-works were considered by the Scunthorpe District Council yesterday week. Contract No. 1 included the retort-house, coal-store, exhauster, boiler, and purifier houses, men's room, smithy, stores, foreman's residence, governor-room, office, gasholder tank, tar and liquor tank, underground water-tank, surface-water drains, and other works. Only one tender was received for this work—viz., that of Messrs. W. Wright and Son, of Lincoln, whose price was £6919. This was accepted. There were four tenders for Contract No. 2, which was for the erection of a retort-bench, condenser, boiler, exhauster, scrubbers, purifiers, meter, gasholder, governor, and other apparatus, and for supplying and laying the main pipes and appendages. The tender of the Leeds Fire-Clay Company, Limited, of Leeds—£7468—was accepted. The highest tender was £1233 more than this. The total of the successful tenders is £14,387, which is £423 above the estimate of the Engineers (Messrs. Stevenson and Burstal). The contracts are to be completed by July 31. It was also decided by the Council to apply to the Public Works Loan Commissioners for a loan of £21,500, repayable in forty years, as provided in the Act. This amount includes the £5500 to be paid to Messrs. Cliff for the old plant.

House Wrecked by an Explosion at Beverley.—A startling explosion took place in Keldgate, Beverley, about ten o'clock on Sunday morning last week. It occurred at the house of a Mrs. Horsley. The premises and household goods were completely demolished; but, strange to say, the inmates—Mrs. Horsley and her sons and daughter—all escaped serious injury. It is stated by a local paper that "gas had been known to be escaping from somewhere in large quantities for several days. All the neighbourhood had complained loudly; and the Gas Office had been appealed to to remedy the matter." The gas must have percolated through the ground into the house, as it is not laid on to the building, and the main is on the other side of the street. It is, however, supposed that the explosion was caused by one of the sons (who was afterwards found buried among the débris) lighting a cigarette in a bedroom. This, as a local contemporary points out, raises the question as to how the whole family escaped suffocation by gas during the night, because if there was sufficient gas in the room to cause an explosion, it would seem that there must have been some very narrow escapes from suffocation while the family were asleep. The force of the explosion is shown by the fact that a door was hurled across the street, and through the window of a house opposite. The property in the neighbourhood is very old; and the houses on either side of the wrecked premises have received a severe shaking, which has made them almost untenantable.

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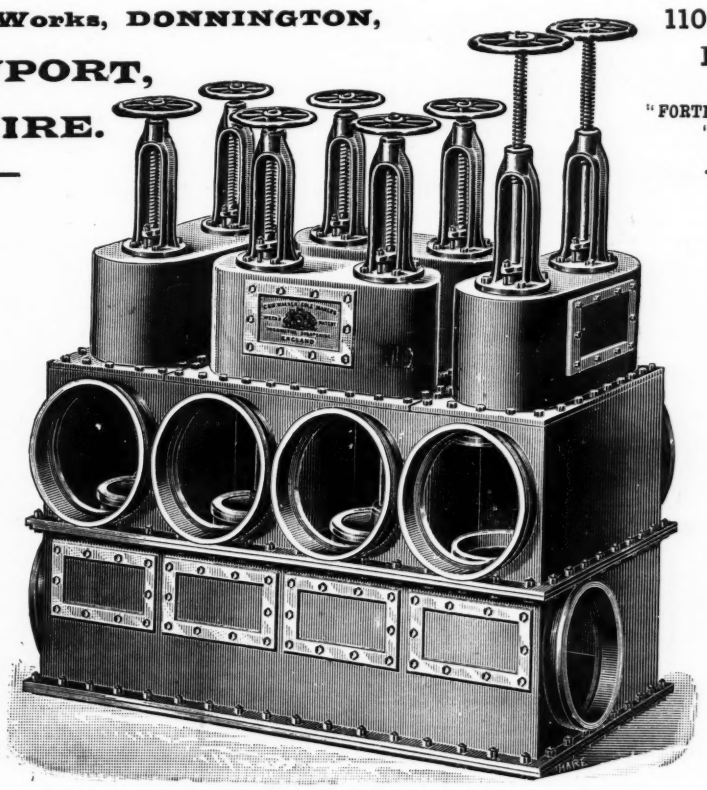

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The Cambridge Municipalization Scheme.—The demand which was made at the recent meeting of ratepayers for a poll on the municipalization scheme (which included the acquisition of the Water Company's property) has been withdrawn, so that the Bill will not now be proceeded with.

The Quality of the Gas at Maidstone.—The Maidstone Gas Company must be wicked to the extreme. It is the belief of Mr. G. King, a member of the District Council, that they supply, in the course of a day, two qualities of gas—the superior in the morning, and the poorer in the evening. So convinced are Mr. King and some of his colleagues that this is so, that, at the last meeting of the Council, they passed a resolution instructing the Gas Examiner to make his tests in the evening instead of the morning. A little enlightenment on the subject of the manufacture and distribution of gas is badly wanted in the governing circle of Maidstone.

The Supply of Coal for the Ripon Gas-Works.—At the quarterly meeting of the Ripon City Council last Thursday, Mr. Walker asked if any satisfactory arrangements had been made in regard to the supply of coal to the gas-works. The Manager (Mr. E. E. J. Anderson) stated that, in consequence of the difficulty of obtaining coal, the Committee had authorized him to reduce the candle power of the gas. Alderman Lee observed that the Committee ordered the quality of the gas to be reduced because the price of coal had gone up 25 per cent. The Manager stated that more room was required at the gas-works for the storage of coal. Of late the candle power of the gas varied from 16 to 18 according to the quality of the coal. Subsequently it was resolved to increase the Manager's salary by £25 per annum, and to give him a gratuity of £50 for engineering work done in connection with the recent extensions.

The Profits of the Gas and Water Undertakings of the Hull Corporation.—The Engineer of the Hull Corporation Gas and Water Departments (Mr. F. J. Bancroft) has submitted an estimate of receipts and expenditure to his Committee for the year ending March 31, 1901; and the statement no doubt afforded very pleasant reading to the Committee. The receipts from the gas undertaking are expected to be £13,903, and the expenditure £9975; leaving a gross profit of £3928. Of this amount, however, interest and sinking fund will claim £3887; so that the net profit will be but £41. These figures are arrived at on the supposition that by the end of March next the Broadley Street gas-works will be dismantled, and the Committee would purchase 100 million cubic feet of gas from the British Gaslight Company at 1s. 6d. per 1000 cubic feet, and dispose of it at 2s. 10d. per 1000 feet. The cost of manufacturing gas at the Broadley Street works is 1s. 7d. per 1000 feet, or 1d. more than the Committee will purchase it for; but they will not have any residuals for sale, which will make all the difference. The estimates for the Water Department predict a net profit on the year's working of £9858, after paying £13,628 sinking fund and interest, and contributing £2600 to the city fund. In other words, the receipts will be £52,832, the expenditure £26,746, and the gross profits £26,086, or more than 50 per cent. Considerable reductions in charges were recently authorized; and consequently these figures are very gratifying.

An Additional Water Supply for Nottingham.—Pumping at the new water borings at Boughton belonging to the Nottingham Corporation has been going on for some time now, with the result that no appreciable impression has been made upon the supply; and the putting down of permanent works at the earliest opportunity is fully justified.

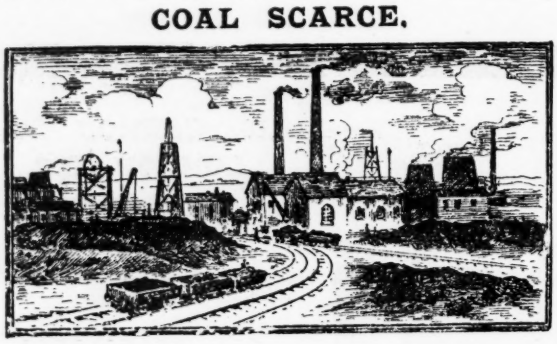
Scotch Water for London.—Wales and even the Lakes have been considered from time to time as possible sources of additional water for the Metropolis; but the opinion has lately been put forward that London will ultimately—the time will doubtless be very distant—have to go to the Highlands of Scotland for an adequate water supply, the northern part of the kingdom being in the fortunate position of having a store sufficient for the needs of even a larger population than that of the Metropolis.

The Maidenhead Town Council and the Water Company.—At a recent meeting of the Maidenhead Town Council, the Water Committee reported that they had had under consideration the draft Provisional Order promoted by the Maidenhead Water Company for obtaining power to raise additional capital, and they were of opinion that it was highly desirable that the application should be opposed by the Council. The Committee therefore recommended that a representation be made to the Board of Trade embodying objections to the Order. The Committee submitted that the supply of water to the borough should be in the hands of the Corporation. The document embodying the objections was brought up, and ordered to be sealed.

Water for the Paris Exhibition.—The quantity of water required for the machinery at the Paris Exhibition is estimated to be 1760 million gallons, the length of pipe at about 17½ miles, and the weight of iron at 380 metric tons. A main conduit for Seine water, 24 inches in diameter, will be laid along the entire length of the Champ de Mars, and will feed the generators. Smaller pipes will branch off this, and serve the various buildings, round which a conduit for spring water will run. The water for the gardens will be taken from the Ourcq, and will be supplied gratuitously by the Municipality, as well as about 1½ million gallons daily from the Seine. The spring water laid on for the visitors will be paid for at the rate of 1½d. for 220 gallons.

A Danger to the Cardiff Water Supply.—At a recent meeting of the Water Committee of the Cardiff Corporation, Mr. Allen directed attention to the effect produced on iron pipes by the water supplied to the borough. He said experience in his trade had shown him that the soft water now supplied in Cardiff was forming a deposit of oxide of iron in the pipes, and this fact was an ever-present source of grave danger to the inhabitants, besides shortening the life and diminishing the service of the large mains. Comparative tables were produced by the Engineer, who endorsed Mr. Allen's remarks, but showed that softer water was supplied to many large towns in the country. This statement suggested that there was a constituent in the Cardiff water which affected the pipes, and that mere hardening would not remove the oxidation. It was agreed that samples of water should be submitted for chemical analysis.

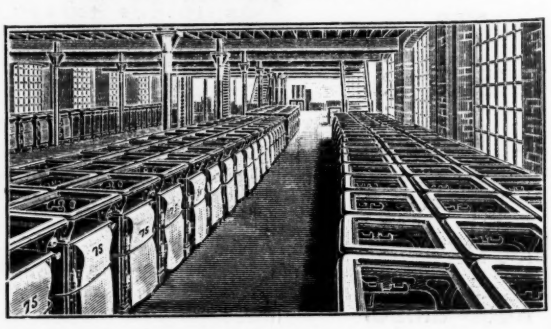
COAL SCARCE.



There is a tide in the affairs of men (and Gas Departments), ∧ which, taken at the flood, leads on to fortune.

Julius Cæsar IV., 3.

STOVES PLENTIFUL.



N.B.—Perhaps the Reader will supply the Advertisers' Name.

Weardale and Shildon Water Company.—The accounts of this Company for the year ending Dec. 31 last, show that the net revenue amounts to £43,947, including £10,707 brought forward. From this, an interim dividend amounting to £15,000, and income-tax to the extent of £1252 have been paid. A dividend of 13s. 9d. per share is now recommended; making the distribution for the year 5¼ per cent., and leaving £11,194 to be carried forward.

Cambridgeshire County Council and the South Essex Water Bill.—The South Essex Water Company's Bill is going to meet with severe opposition. Among the other authorities who have decided to appear against it is the Cambridgeshire County Council. During a discussion on the question by this body last Thursday, it was stated by Alderman Finch that it seemed to him they had never had such a grave attack upon their water supply as that which was proposed in the Bill. He found there was to be an open surface in the water-bearing strata of 160,000 square feet; and this would be equal to 1000 wells with an average depth of 8 feet of water kept constantly pumped out. They were in the presence of a very grave inroad on their supplies; and whatever might be the cost of the opposition, there was no alternative for the Council but to resist the Bill.

Budleigh Salterton Water Supply.—In view of the undoubted necessity for a larger water supply, the Budleigh Salterton District Council have decided to increase the storage capacity of their Sherbrooke reservoirs. The Surveyor stated that the reservoirs were full, and that if there were more storage there would be no difficulty in providing for the dry weather. An engineer is to be consulted with reference to the manner in which effect shall be given to the resolution. On the advice of Mr. Martin, the Council have decided to oppose the Bill of the Exmouth Water Company. He reported that the works proposed to be carried out by the Company would probably affect the springs which help to supply Budleigh Salterton, and recommended that a clause should be inserted in the Bill empowering the Council to call upon the Company at any future time to supply water to Budleigh Salterton from the intended works in quantities and at prices to be named in the Bill.

St. Agnes Water Supply.—An unfortunate difficulty has arisen in regard to the execution of the works for the supply of water to St. Agnes, which has engaged the attention of the Truro Rural District Council for the last year or two. The district consists of a number of scattered hamlets, and difficulty was found in obtaining a supply which would serve them all, at a cost which was not altogether prohibitive. The problem was apparently solved by a scheme propounded by Mr. R. H. Worth, of Plymouth. A Local Government Board inquiry was held, and matters had made such progress that orders were placed for the engines and pumps and other material required. When this had been done, the Duchy of Cornwall intervened with an objection to the diversion of the water which was to be obtained from certain old mining works over which the Duchy claims mineral rights. This objection appears likely to prove fatal to at least one portion of the scheme.

The Consumption of Water in Manchester.—Some interesting comparative statistics as to the quantity of water distributed in Manchester during the past three years have been published. The average quantity supplied per day in 1899 from Longdendale was 24,818,280 gallons, and from Thirlmere 7,621,613 gallons—total 32,439,893 gallons. In 1898, Longdendale 22,631,285 gallons, and Thirlmere 7,635,570 gallons—total 30,266,855 gallons. In 1897, Longdendale 21,275,007 gallons, and Thirlmere 7,537,947 gallons—total 28,812,954 gallons. Last year, the greatest consumption took place in August, when the average daily quantity supplied was 36,146,727 gallons; and the lowest in April, when the amount was 29,371,063 gallons. The maximum quantity drawn from Longdendale was in August, when the daily supply was 28,204,466 gallons, and the maximum for Thirlmere in October, when the daily quantity was 8,596,041 gallons. It is a noteworthy circumstance that on many occasions a dry period at Longdendale has been accompanied by a heavy rainfall at Thirlmere and *vice versâ*, which shows that the possession of two sources of supply situated widely apart has advantages.

At the forthcoming half-yearly meeting of the Brentford Gas Company, the Directors will recommend dividends at the rates of 12 and 9 per cent. per annum.

December, it is reported, was a record month at Stourbridge in the quantity of gas made and sent out. Prepayment meters and gas-cookers are still getting fresh patrons; there being 2472 of the former, and 1092 of the latter now in use.

A Company has been formed in Milan, with a capital of 350,000 lire, in shares of 10,000 lire each, to work the Van Vriesland patent for the production of ærogene gas, a brilliant display of which was made at the Aquarium Exhibition (see *ante*, p. 92).

The Dorking Rural District Council have agreed to join the Urban Council in opposing the Water Company's Bill with a view to the insertion of a purchase clause. If such a clause is obtained, it does not appear likely that the Authorities will take immediate advantage of it.

As the result of the new application of artificial silk to the production of mantles for incandescent gas lighting, the industry is rapidly increasing in magnitude. The Besançon factory produces about 662 lbs. per week, yet the demands cannot be supplied; and the opening of new factories in Belgium and Germany is announced.

At the meeting of the Severn Board of Conservators, held last Thursday, at Birmingham, Mr. Willis Bund, who presided, in moving the adoption of the report, said that, although the take of fish was larger than usual, they had still to face the continued pollution of the water and the effects of the Liverpool Water-Works scheme on the fisheries. He thought the Welsh scheme of the London County Council would be abandoned; the Royal Commissioners having reported that there was no necessity for going to Wales for water.

Messrs. Joseph Taylor and Co., of Bolton, have just fixed complete for the representatives of the late John Wedgwood, of the Bignall Hill Collieries, Newcastle, Staffs. (including sulphate stores, mother-liquor tank, &c.), a solid-plate lead saturator of their latest construction, with double ammonia pipes, solid drawn and detachable, the walls of which are 1 inch thick. It is similar to one recently erected for the Wigan Corporation Gas Department. They have also in course of construction a saturator with walls 1½ inches thick for the Richmond (Surrey) Gas Company; and they have received orders for one made of 1½-inch plate lead for the body, with the bottom 2 inches thick, and fitted with 1¾-inch plate lead well, for a Wilton's discharger, to be fixed at the Bury Corporation Gas-Works. It is to have double ammonia pipes 3 inches in diameter and 1 inch thick, and to be of their latest construction. The firm have just delivered a timber-cased saturator to the order of the Carnarvon Corporation Gas Department.

The Manchester and District Junior Gas Association paid a visit on the 20th inst. to the works of Messrs. Richmond and Co., Limited, at Warrington. There was a large attendance of members, who, accompanied by Mr. R. H. Garlick (President) and Messrs. A. E. Mottram and E. J. Wellins (Joint Hon. Secretaries), arrived at Warrington at 2.50 p.m. They were met by Mr. J. Ransome and Mr. C. R. Adamson, and escorted to the Company's works in Academy Street, where they were joined by Mr. E. W. T. Richmond, the Chairman and Managing-Director of the Company, and conducted round the works; the various operations being explained by him and his colleagues. The men were all fully employed in each department, so that the visitors had an opportunity of seeing every branch of work in actual progress. Having inspected the works, a move was made to the Patten Arms Hotel, where a lecture, illustrated by photographs and lantern slides, was delivered by Mr. Richmond, dealing with prominent Gas Engineers in the United Kingdom who had secured important positions while young men. He also sketched the career of several prominent Gas Engineers who had introduced, or been responsible for, important developments in popularizing gas for domestic and other purposes. At the close of the lecture, the party took tea together; Mr. Richmond being in the chair. A smoking concert followed; and then the party dispersed for Manchester and other places. Before leaving, a hearty vote of thanks was accorded to Mr. Richmond, Mr. Ransome, and Mr. Adamson.

TO SUBSCRIBERS.

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Payable in Advance.

If credit is taken, the charge is 25s. a year.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1900, are reminded that this should be done at once.

All communications, remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

NOTICE TO ADVERTISERS.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
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OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London," LONDON, E.C.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

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JOHN NICHOLSON & SONS, Limited,

Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.

SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough,

Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application
No. 30, ST. ANDREW SQUARE, EDINBURGH,
NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, See Jan. 2, p. 2.]

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.
VICTORIA PAINT WORKS, MANCHESTER.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Conpanies.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ENRICH your Gas with cheap Benzol. Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND Co., MIDDLESBROUGH.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

GAS TAR wanted.
BROTHERTON AND Co, Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

PRACTICAL RETORT SETTERS.
GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

THE Gas Company in the South of England recently advertising for Gas-Fitters (No. 3409) beg to THANK APPLICANTS, and to inform them that the VACANCIES HAVE BEEN FILLED UP.

ADVERTISER, with good connection among Gas Companies, will be glad to hear of COMMISSIONS.
Address No. 3415, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Gas-Fitter. Twenty-three Years' Experience. Service and Meter Fitting, Main Laying, &c. Thorough knowledge, and good character.
J. BRYANT, 24, Radley Road, Abingdon, BERKS.

TO TAR DISTILLERS.
WANTED, Employment as Carbolic and CRESYLIC ACID MAKER by a New and Improved Process (guaranteed to save 25 per cent.). Well up in all the latest methods of Tar Distilling.
Address No. 3414, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser (Gas Manager's Son), Age 28, is desirous of obtaining the MANAGEMENT of Gas-Works making 6 to 20 million cubic feet per annum. Acquainted with modern Plant. Testimonials as to Character and Ability.
Address No. 3422, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Mechanical Draughtsman. Apply, in person, to the ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED, 19, Abingdon Street, WESTMINSTER, S.W.

MANAGER wanted by the Stanley and District Gas Company (make 18 Millions).
Write, stating Age, Salary required, and enclosing *copies* of two recent Testimonials, to BURN, Stanley R.S.O., DURHAM.

WANTED, a competent Gas-Fitter, accustomed to the erection of Public Street-Lamp Columns, Lanterns, &c., fixing and adjustment of Incandescent Burners, and General Fitting. Constant Employment and good Wages to smart Man of good address.
Apply in writing, stating Age and Experience, to S. PONTIFEX AND Co., 22, COLEMAN STREET, E.C.

THE Ennis Gas Consumers' Company, Limited, require the services of a Man as MANAGER and GAS-FITTER. Must be a good Carbonizer, Layer of Mains and Services, and understand Gas Engine and Exhauster. Salary 30s. per week, with House, Fuel, and Light free.
Send Testimonials with applications.
Address the SECRETARY, Gas-Works, Ennis, Co. CLARE.

COUNTY COUNCIL OF MIDDLESEX.

TESTING AND STAMPING GAS-METERS.
APPOINTMENT OF INSPECTOR & ASSISTANTS.

THE County Council are prepared to receive APPLICATIONS for the APPOINTMENT of an INSPECTOR for the purpose of Testing and Stamping Gas-Meters under the Sale of Gas Act, 1859, and the Sale of Gas Amendment Act, 1860, and also for the appointments of four ASSISTANTS to the Inspector.

Candidates must not be more than 40 Years of age, must have had experience in connection with the Testing of Gas-Meters, and must be prepared to devote the whole of their time to the duties connected with the appointments.

The Salaries will be at the rate of £200 per annum for the Inspector, and at the rate of £80 per annum each for the Assistants.

The Officers will not be entitled to any Pension or Superannuation Allowance; and the appointments will be held during the pleasure of the Council.

The Officers may be required to give Security in the shape of a Guarantee Policy, the Premium upon which will be paid by the County Council.

Applications (stating Age, Qualifications, &c.), accompanied by *copies* of not more than three recent Testimonials, must be sent in on or before Feb. 7, 1900, to the Clerk of the County Council, Guildhall, Westminster, S.W.

The Officers appointed will probably be required to commence their duties about the first week in April.

Canvassing personally or by letter will disqualify a candidate.

RICHARD NICHOLSON,
Clerk of the County Council.
Guildhall, Westminster, S.W.,
Jan. 25, 1900.

THE DERWENT VALLEY WATER BOARD.

APPOINTMENT OF ENGINEER.

BY the Derwent Valley Water Act, 1899, the Derwent Valley Water Board are authorized to construct six large Reservoirs in the Valleys of the Derwent and the Ashop in Derbyshire, together with important subsidiary Works in connection therewith to deal with an estimated flow of Fifty Million Gallons of Water per day. The Reservoirs will be constructed successively; and the execution of these and the other authorized Works is expected to occupy many Years.

Applications are now desired for the position of ENGINEER to the Board. The Engineer will be responsible for the Designing and Construction of the Works. He will be required to reside in the neighbourhood of the Works, and to devote the whole of his time to his duties under the Board, and to have daily personal charge of the work in hand. The staff of Assistants, Inspectors, Draughtsmen, Clerks, and others necessary in the carrying out of the work will be provided by the Board, and be under the direction of the Engineer.

The engagement will (subject to the services rendered being satisfactory) be certainly until the first two Reservoirs are completed (this work it is estimated will take some Ten Years to carry out), and may be a permanent one. The Engineer on his part will be required to enter into an agreement to remain in the exclusive service of the Board until the first two Reservoirs are completed. The Board reserve the power of determining the engagement with the Engineer on giving him Six Months' Notice, in case his services are not considered satisfactory.

It is indispensable that Candidates for the appointment should have had considerable experience in designing and constructing Reservoirs and Gravitation Water-Works.

The Board reserve the right (which they will probably exercise) to appoint, or take the opinion of, a Consulting Engineer or Consulting Engineers on the Works, when and as desired.

Each Applicant must furnish at least two References and *copies* of Testimonials (which cannot be returned, and which preferably should be printed); the Board having the right to call for the production of the originals.

Applicants must state Age, Experience, Present Position, Salary required, when at Liberty, and general state of Health. Personal Canvassing will be a disqualification.

Communications to be sent to me not later than the 10th day of March, 1900, marked on the outside "Derwent Valley Engineer."

JAMES BELL,
Clerk to the Board.
Bowton Buildings, Bowling Green Street,
Leicester, Jan. 17, 1900.

WANTED, a Stoker. Constant Employment. Wages 32s. per week.
Also a MAIN and SERVICE LAYER. Wages 28s. per week.
Apply, at once, to F. A. NIVEN, Gas-Works, ROWLEY REGIS.

WANTED, a steady and competent Gas-FITTER, experienced in Fixing Meters and Stoves, and accustomed to all kinds of Internal Fitting.
Apply, stating Wages, Age, and References, to S. CROSSLAND, Gas Offices, Abingdon, BERKS.

BEDFORD GASLIGHT COMPANY.
WANTED, at once, a steady Young MAN to take charge of Exhausters and Machinery, and competent to overhaul same. State Age, Experience, Wages required, and give Reference. Average Daily Make 600,000 cubic feet.
Apply to the SECRETARY.

WANTED, an energetic Man (of good address) for Gas-Works within 32 miles of London, who understands Incandescent Burner Fixing, Main and Service Laying, Meters, and Stoves.
State Experience, Salary required, Age, and *copies* of three Testimonials, to No. 3423, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted, able to take out Quantities and make Specifications for Gas-Works Construction and Plant, and with knowledge of general Building Construction and Structural Ironwork.
Apply, stating Salary required, and sending not less than three recent Testimonials of work, to the ENGINEER, Gas-Works, COVENTRY.

WANTED, at once, a steady reliable WORKING MANAGER for a small Gas-Works in Ireland (Make about 2 Millions per annum). Must be a good Retort Setter, a practical Main and Service Layer, &c. Wages 35s. per week, with House, Fuel, Light, &c.
Apply, by letter, in own Handwriting, stating Age, and enclosing *copies* of recent Testimonials, to No. 3420, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager to take charge of, and perform the duties connected with, Gas-Works in Derbyshire, making about 6 million cubic feet per annum. Must be capable of Managing Gas-Engine, and able to lay Mains.
Wages 26s. a week, with House, Garden, Coal, and Gas.
Applicants must state, by letter, Age and Experience, and send *copies* of Testimonials, to No. 3421, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MACHINERY WANTED.
TAR-STILLS—Two wanted, each about 25 Tons capacity.
Send full Particulars and Price to No. 3419, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, good second-hand ConDENSERS, with 12-inch Connections. Annular preferred.
Particulars and Price to Mr. LANE, Gas-Works, AYLESBURY.

STATION METER.
WANTED, second-hand Station Meter, capable of passing 50,000 cubic feet per hour.
Apply, by letter, with full Particulars, to No. 3416, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRON ROOF for Sale, 78 feet long by 53 ft. 4 in. Span, in first-class condition.
Apply to CLAYTON, SON, AND Co., LIMITED, Hunslet, LEEDS.

ENGINES and Exhausters, from 1500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.
J. F. BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

EDINBURGH AND LEITH CORPORATIONS GAS.

CONSTRUCTIONAL IRONWORK.
CONTRACT No. 20.

THE Commissioners are prepared to receive TENDERS for the supply of CONSTRUCTIONAL IRONWORK, comprising ROOFS, FLOORS, STANDARDS, LATTICE GIRDERS, &c., &c., for their Gas-Works at Granton, near Edinburgh.

Specification, Schedule of Quantities, and Form of Tender may be obtained on application to Mr. W. R. Herring, Chief Engineer, Edinburgh, and fully detailed Drawings may be inspected on application at his Office, New Street, Edinburgh.

Tenders, endorsed "Tender for Roofs and Floors," are to be addressed to the undersigned, and delivered at 25, Waterloo Place, on or before Ten a.m. on the 12th day of February, 1900.

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.
25, Waterloo Place,
Edinburgh, Jan. 17, 1900.

ROTHERHAM CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for RETORTS and FIRE-BRICKS.

Particulars and Tender Forms may be obtained on application to the Engineer (Mr. F. A. Winstanley).

Tenders, endorsed "Fire Goods," to be delivered to the Town Clerk's Office not later than Feb. 14 next.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board are prepared to receive TENDERS for the supply of FIRE-CLAY GOODS as follows:—

For Accrington Works, 84 RETORTS, and about 20,000 BRICKS.

For Great Harwood Works, 56 RETORTS, and about 15,000 BRICKS.

Tenders, endorsed "Fire-Clay Goods," must be in my hands on or before Wednesday, the 7th of February.

By order,
CHAS. HARRISON,
General Manager.

General Offices: St. James' Street,
Accrington, Jan. 15, 1900.

FAVERSHAM GAS COMPANY.

THE Directors are prepared to receive TENDERS for a THREE-LIFT TELESCOPIC GASHOLDER, 60 feet high, and of an average diameter of 86 feet. Also a STEEL GASHOLDER TANK for same, 20 feet high by 90 feet diameter.

Plans and Specifications can be seen, and all Information obtained, at the Offices of H. E. Jones, Esq., Gas-Works, Stepney, E., or at the Gas-Works, Faversham.

Tenders, sealed and endorsed "New Gasholder," must be delivered to the undersigned at 20, West Street, Faversham, not later than Six p.m., on Tuesday, the 13th of February, 1900.

TASSELL AND SON,
Secretaries.

20, West Street, Faversham,
Jan. 27, 1900.

CLACTON URBAN DISTRICT COUNCIL.

BRICK GASHOLDER TANK.
CONTRACT No. 1.

THE Gas and Water Committee of the above Council are prepared to receive TENDERS for the construction of BRICK GASHOLDER TANK, 82 feet diameter by 20 feet deep.

Copies of the Specification, Form of Tender, and Drawings may be obtained from the Engineer, Mr. Sydney Francis, Town Hall, Clacton-on-Sea, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Tender for Gasholder Tank," to be delivered to the undersigned not later than Twelve o'clock noon on Monday, Feb. 5, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk.

Town Hall Buildings,
Clacton-on-Sea, Jan. 22, 1900.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO RETORT AND FIRE-BRICK MAKERS.

THE Directors of this Company invite TENDERS for the supply of RETORTS, FIRE-BRICKS, and TILES for the construction of Fifteen Settings of Ten Retorts each, at their Grimesthorpe Works.

Specifications, Quantities, and Forms of Tender may be obtained from the Company's Engineer, Mr. J. W. Morrison, on and after the 24th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Tender for Fire-Clay Goods," must be delivered to the undersigned, by post, not later than the first post on Friday, the 9th day of February next.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street,
Sheffield, Jan. 16, 1900.

LIVERPOOL UNITED GASLIGHT COMPANY.

TAR.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the TAR produced at their several Works for a period of One, Two, or Three Years from July 1, 1900.

The quantities of Tar produced per annum are estimated to be as follows; but the same cannot be guaranteed, and may be more or less:—

At the Athol Street Works, about			600,000	gallons.
„	Eccles Street	„	530,000	„
„	Caryl Street	„	400,000	„
„	Wavertree	„	550,000	„
„	Linacre	„	2,500,000	„
„	Garston	„	300,000	„

The Tenders may be for the whole, or for one or more of the Works separately, or for a definite quantity from Linacre Works.

Forms of Tender and full Particulars may be obtained on application to the undersigned.

Tenders, sealed and endorsed "Tender for Tar," are to be delivered here not later than the 20th of February, 1900.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

By order
WILLIAM KING,
Engineer.

Gas Office: Duke Street, Liverpool,
Jan. 17, 1900.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of FIRE-BRICKS, RETORTS, &c., for their various Works.

Full Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m., on Thursday, the 8th of February, 1900.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Jan. 27, 1900.

FENTON URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the supply and delivery of from 6000 to 8000 Tons of GAS BURGY or NUTS, to be delivered in such quantities and at such times as the Manager may require during a period of Twelve Months.

Form of Tender and further Particulars to be obtained from Mr. R. Surtees, Manager.

Tenders to be sealed and endorsed "Tender for Coal," addressed to the Chairman, Gas Committee, Gas-Works, Fenton, Staffs., and delivered not later than Wednesday, Feb. 14, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

H. J. CRUTCHLEY,
Secretary.

Gas Offices, Fenton,
Jan. 27, 1900.

THE Corporation of Middleton are pre- pared to receive TENDERS for the WET and DRY GAS-METERS, TUBES and FITTINGS, SULPHURIC ACID, LIME, FIRE-CLAY GOODS, and CAST-IRON PIPES required at their Gas-Works during the ensuing Twelve Months.

Further Particulars and Form of Tender may be obtained from Mr. T. Duxbury, Gas Engineer.

Tenders, addressed to the Chairman of the Gas, &c., Committee, to be delivered at my Office on or before Wednesday, the 7th of February, 1900, endorsed "Tenders for Meters" or "Tubes, &c.," as the case may be.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Jan. 23, 1900.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that an EXTRAORDINARY MEETING OF THE PROPRIETORS OF THE SOUTH METROPOLITAN GAS COMPANY will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 14th day of February next at 2.30 o'clock in the afternoon, or so soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to Empower the South Metropolitan Gas Company to Alter the Provisions as to the Standard Price and Illuminating Power of the Gas supplied by the Company, to Construct a Railway in the Parish of Greenwich, and to Purchase, by Agreement, so much of the Southern Portion of the Undertaking of The Gaslight and Coke Company as is situate in the County of London, South of the Thames, and for other Purposes."

At such Meeting, the said Bill will be Submitted for the consideration and approval of the Proprietors.

Dated this 27th day of January, 1900.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 16th day of February, 1900, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st day of December last, to declare a Dividend for the same period, to elect two Directors in the place of those retiring by rotation, and one Auditor in the place of Mr. Lass, resigned, and for general purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 2nd day of February, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Feb. 1, 1900.

BARNSTAPLE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 17th day of February, 1900, at Twelve o'clock at noon, to receive the Report of the Directors and the Accounts for the Year ended the 1st day of October last, to declare a Dividend, to elect Directors and an Auditor, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd to the 17th of February (both days inclusive).

By order of the Board,
F. L. SCHOFIELD,
Secretary.

Offices: The Square,
Barnstaple, Jan. 8, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

NEW ISSUE OF £7000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 13, 1900, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HORNSEY GAS COMPANY.

£9000 FIVE PER CENT. PREFERENCE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Thursday, the 22nd of February, at Two o'clock, in Lots.

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PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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LONDONDERRY COLLIERIES,

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Available Output up to 5000 Tons per day.

Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by

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FOR PRICES AND PARTICULARS, APPLY TO

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COUNTY OF DURHAM.

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GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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ANALYSIS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

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Analysis made by Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500	Cub. Ft.
Illuminating Power	16·9	Candles.
Coke (of good quality)	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

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Illuminating Power . . . . . 38·22 candles.
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Coke . . . . . 70 per cent.

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Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

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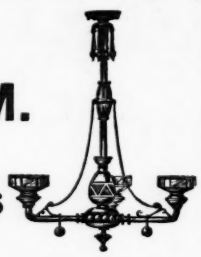

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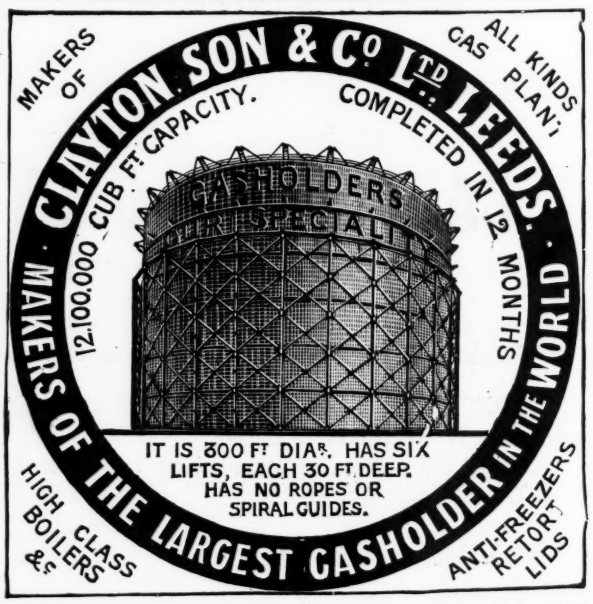
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IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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The "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming 3½ feet of Gas per hour. Having an efficiency of 25-Candle Power per Cubic Foot of Gas consumed, it is not only the BEST but CHEAPEST Intensive CHIMNEYLESS Burner on the Market.

PRICE COMPLETE WITH MANTLE

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All other Burners supplied by the Syndicate proportionately Reduced, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

NOTE—THE DENAYROUZE LIGHT SYNDICATE has carried out the work in connection with all the Installations of Van Vriesland's Oil Gas in England, together with the entire work and fitting of the Grand Exhibit in North-West Gallery of the Royal Aquarium, Westminster, where all their Burners can still be seen in operation.

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A SYSTEM OF BURNING VAPOURIZED PETROLEUM WITHIN AN INCANDESCENT MANTLE.

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STREET-LAMPS—Self-Contained Plant, easily fixed, no tearing up of Thoroughfares.

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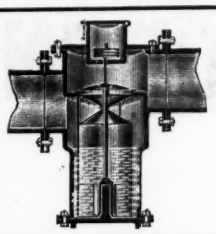

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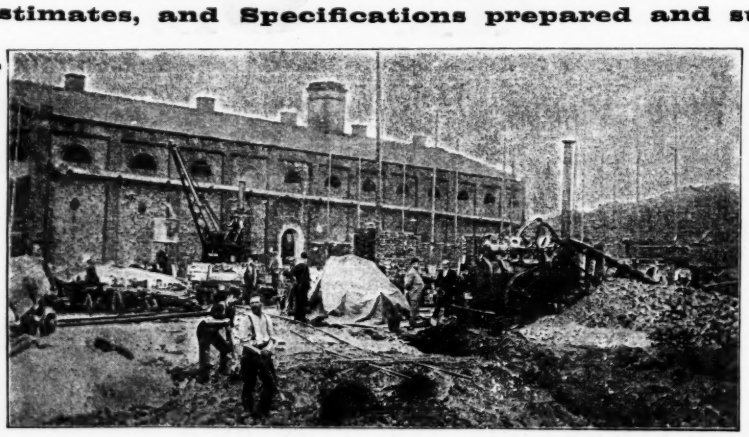

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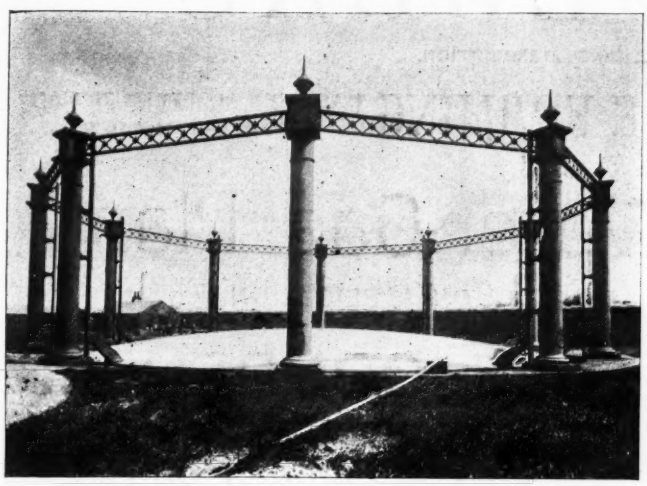
GASHOLDERS



A GASHOLDER

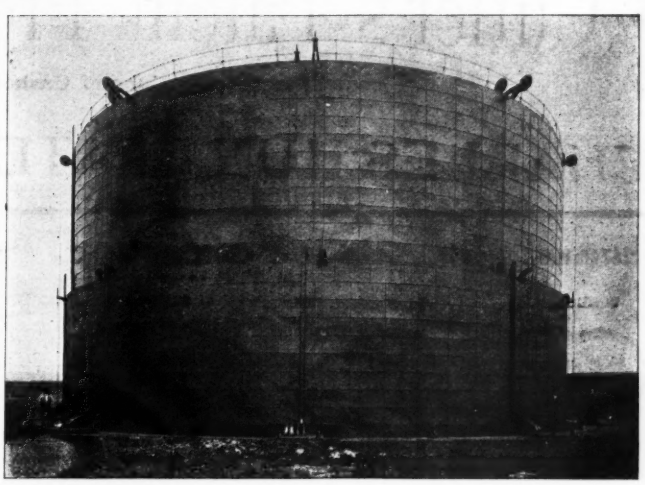
Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.

AS IT WAS

originally erected by us

IN 1883.

We last year took down the Guide-Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it



AS IT IS NOW

entirely guided by our Patent Steel Cable System.

In many other instances, Columns have been sold and replaced by our Cables.

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders will find the Cable System vastly superior and quite reliable.

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Over 120 now in use.

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For keeping Cups of Gasholders free from Ice.

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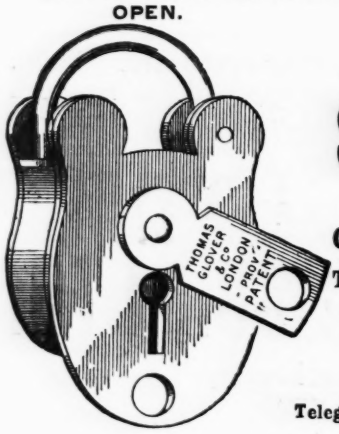

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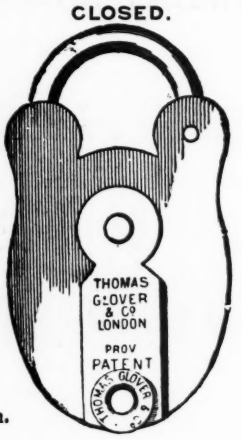

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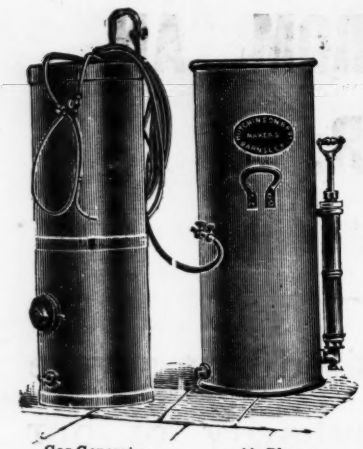

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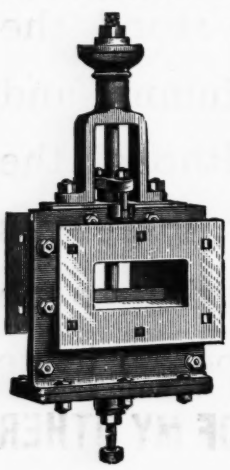

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